RayFish Product Family

Transportable Transceiver System

iDEN Transceiver Operations Manual

P/N 7029612 Rev D

iDEN TRANSCEIVER SOFTWARE VERSION 2.4

17 June 2013

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CHANGE RECORD

Revision	Change Details	Issue Date
--	Initial Release - new iDEN Transceiver Operator Manual to replace the Operator Manual #3092576 (obsolete). Manual 3093576 is being replaced by manuals specific to each of the RayFish software application (e.g., separate manuals for GSM CDMA, and iDEN). New iDEN Transceiver software version 2.0 is incorporated per NR 53164.	16 February 2009
A	iDEN software release 2.1 incorporated per CO0056529. Includes new software features: Paging Only MS DF, Advanced BTS, synchronization, Map Router, and Window Vista Support. The manual's name has been changed from "Operator Manual" to "Operations Manual" to comply with new standard for naming manuals.	05 October 2009
B	iDEN software release 2.2 incorporated per CO0088208. Includes new software features: Option to display data view results by Session Tag, access Advanced BTS from Providers and Subscriber tabs, perform Registration on multiple providers, Windows 7 compatibility, and remove sensitive terminology.	08 August 2011
C	iDEN software release 2.3 incorporated per CO0103684. Updated release date and release version.	23 July 2012
D	iDEN software release 2.4 incorporated per NPR-1262 (C00120525). Updated and released per software version 2.4.	17 June 2013

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Warnings and Cautions

High Voltage or Shock



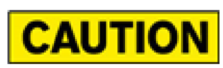
This **Warning** label indicates that the user must not attempt to reach inside the RayFish unit or place objects inside the housing to prevent serious injury. Do not expose this equipment to rain or moisture and take care to avoid spilling liquids into the enclosure.

Restricted Use



This **Warning** label indicates that RayFish is a restricted use item and can only be sold to authorized law enforcement and government agencies. RayFish use shall comply with all local, state and federal statutes and regulations associated with the monitoring of cellular transmissions. Harris Corporation assumes no liability for any misuse or improper use of this product and makes no representation as to its suitability for any specific application. Buyer's right to transfer, sell or assign this product shall be limited to authorized law enforcement and government agencies and must be pursuant to the written permission of Harris Corporation.

Caution - Unsafe Practice



This **Caution** label warns against unsafe practices and indicates that the user must not remove or disassemble the RayFish housing (at any time) to prevent damage to the Equipment.

Caution - Read Manual



When text appears below a **CAUTION** label, as above, this indicates that the user must read the manual for proper procedures to prevent damage to the equipment.

Note - Information

NOTE

When text appears in a green **NOTE** box, per this example, this indicates information important for successful operation or understanding.

How to Use This Manual

iDEN Transceiver Manual and Reference Guide

This manual is organized in several sections, containing equipment setup procedures, configuration sequences and operating instructions, with expanded detail on Transceiver functions. Some duplication of material occurs throughout the various chapters since each has been developed for independent reference. Figures and Tables are numbered with reference to chapters, with the first number representing the respective chapter; for example, Figure 2-4 is Figure No. 4 in Chapter 2.

- **Checklist** — *RayFish Operation Checklist* provides a list of important items to remember during equipment setup
- **Chapter 1** — iDEN Operations, describes operations for iDEN modes, including Registration and MS DF
- **Chapter 2** — Tools, describes other software associated with the iDEN Transceiver, including the Database Viewer
- **Appendices** — Provides terms and definitions and system reference information

To ensure successful operational results with the RayFish System, it is essential that the operator be acquainted with the system's full functions and capabilities; therefore users are advised to refer to the complete iDEN Transceiver Manual prior to launching an operational session.

RayFish Operation Checklist

Before using the RayFish System and starting an application, observe the following checklist for procedures to remember during setup and configuration.

1. PC Controller must be connected to the RayFish unit using the provided USB cable.

2. The RayFish unit must be connected to an AC or DC power source using the corresponding power cable provided.

3. Are the antennas properly installed?

   a. The antenna connections are located on the front panel of the RayFish unit.

   b. When using the StingRay II, verify the Receive Antenna is connected to Rx 3 for iDEN operations.

   c. When using a StingRay II with an iDEN duplexer, a KingFish, or a StingRay I:

      - If a power amplifier is used, an additional transmit antenna will be needed when using a StingRay II without a duplexer
      - Use one transmit and one receive antenna for transmit mode operations (such as Registration and MSDF), whether a power amplifier is used or not

   d. If the direction-finding AmberJack is used, it will be connected directly to the RayFish front panel as an additional antenna.

4. Power up the RayFish unit and allow it to complete its startup sequence.

5. Verify the laptop time and date is correct. This will be used to time-stamp system events.

NOTE

Refer to the RayFish Hardware Manual 7028918 for specific hardware setup details, including other devices connected to the system.

iDEN Transceiver Version 2.0 Features

1. **StingRay II Support with Multi-Transmit** — Simultaneously transmit on multiple channels (up to 4), when using the StingRay II.

2. **Analyze Neighbors** — Analyze Neighbors provides the capability to quickly analyze the neighbors of multiple surveyed channels. The user can view a ranking of neighbors based on surveyed RSSI and commonality amongst the selected channels' corresponding Cell IDs. This feature can be used to help determine an effective neighbor for transmit operation.

3. **Survey Progress Bar** — The Status Bar contains the Survey Progress Bar showing the number and percentage of channels surveyed. This progress bar can help the user identify when a survey cycle is complete prior to starting an transmit operation.

4. **Clear/Restart Survey** — The user can clear all channels in the Auto Survey Environment View and restart the Auto Survey. This feature can provide the user with a "fresh" set of survey information.

5. **Bluetooth Connection to KingFish** — The user can now connect to the KingFish via Bluetooth.

6. **Harpoon Power Amplifier Support** — The iDEN Transceiver provides software control for the Harpoon Power Amplifier, as well as real-time status on the state of the Harpoon during operations.

7. **AmberJack W Support** — With added support for the Wide Band AmberJack (AJ-W) DF Antenna, the iDEN Transceiver now provides direction-finding capability.

8. **Night Mode Display Options** — Two new Windows display themes (Gray Night Theme and Green Night Theme) have been added to support reduced light emissions from the user interface display.

iDEN Transceiver Version 2.1 Features

1. **MS DF Paging-Only Mode** — Subscribers can now be actively paged on the Local LAI to reduce registration traffic. Paging-only mode provides a lower impact subscriber registration method.

2. **Advanced Base Transceiver Station (BTS) Editor** — The **Advanced BTS** parameters are used to emulate a base station as well as provide the capability to configure specific transmitted parameters to increase the flexibility of transmit modes.

3. **Advanced Synchronization** — The iDEN Transceiver can now synchronize to networks that may be unsurveyable because of altitude, distance, or other adverse network conditions.

4. **Map Router Support** — Map Router features the ability to route information to mapping software to provide a visual representation of the mobile tracking mission. This information includes tracking vehicle location and Lines of Bearing from AmberJack.

5. **Windows Vista Support** — The iDEN Transceiver now works with Windows XP and Windows Vista. The user should exit the iDEN Transceiver application before switching themes to ensure complete Vista compatibility.

6. **False Harpoon Voltage Standing Wave Ratio (VSWR) Alarms** — To avoid triggering a false alarm, the iDEN Transceiver has been modified to wait for a period, allowing the hardware to settle before declaring a VSWR alarm.

7. **Notification of Corrupt Calibration Table** — The iDEN Personal Computer Controller (PCC) now detects and reports the presence of a corrupt calibration table within the RayFish platforms. If a warning is generated, contact customer support immediately.

iDEN Transceiver Version 2.2 Features

1. **View results by Session Tag** — Added the option to display the data view results by Session Tag in the Database viewer.

2. **Advanced BTS Access from Providers and Subscribers Tab** — Access to the Advanced BTS Options is now available from the Providers and Subscribers Tab.

3. **Perform Registration on Multiple Providers** — The iDEN Controller now allows the option to perform Registration on multiple Providers.

4. **Windows 7 Support** — The iDEN Controller now works with Windows 7 (32 bit operating system).

5. **Terminology** — The iDEN Controller software is updated to update terminology.

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Chapter

1 iDEN OPERATIONS

1-1 WHAT THIS CHAPTER CONTAINS

This chapter contains the steps necessary to operate the RayFish system with the iDEN Transceiver application, as well as the Harris AmberJack DF antenna and external Power Amplifier.

1-2 SUPPORTED OPERATING SYSTEMS

The iDEN Controller application supports *Microsoft® Windows XP* (32-bit OS) and *Windows Vista®* (32-bit OS), and Windows 7 (32-bit OS).

1-3 iDEN TRANSCEIVER INSTALLATION

The iDEN Transceiver application comes pre-installed and tested on the PC. Should the need arise to reinstall or upgrade the iDEN Transceiver application on the PC, refer to the Installation Guide included with the application software or contact Harris Corporation Wireless Products Group for technical support.

1-3.1 iDEN TRANSCEIVER STARTUP

The following steps prepare for iDEN operation.

Step 1. Launch the iDEN Transceiver application by selecting it from the start menu or double clicking on the desktop icon (see Figure 1-1).



Figure 1-1. iDEN Transceiver Icon

Step 2. The Startup splash screen (see Figure 1-2) will appear.



Figure 1-2. iDEN Transceiver Splash Screen

Step 3. Allow a brief period for iDEN Transceiver to initialize.

Step 4. Once initialized, the main iDEN Transceiver screen (see Figure 1-3) will appear.

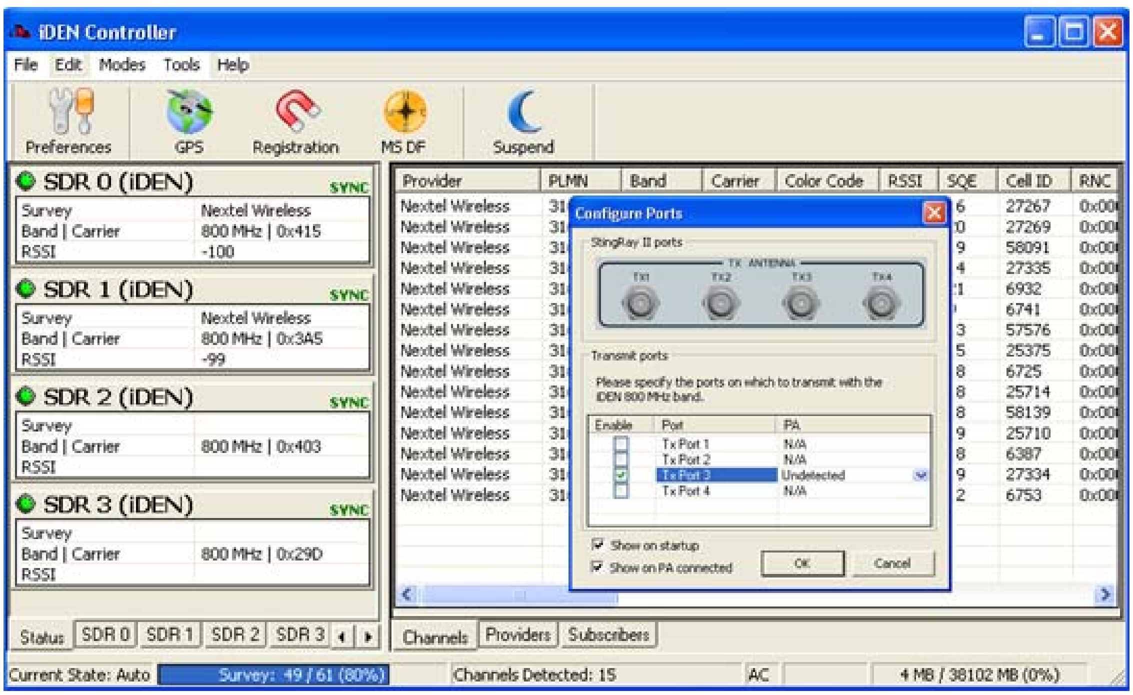


Figure 1-3. iDEN Transceiver Initial Screen

Step 5. When using a StingRay II, the **Configure Ports** dialog will appear. The default is to transmit on Tx Port 1. Make sure to set the **Transmit Port** to a port that is not currently used by other applications. When no Power Amplifier is connected, **Undetected** is displayed in the PA column. If a Power Amplifier is connected, Configure the Transmit ports accordingly. If no external PA is connected, just Click **OK** to Close the dialog.

1-4 MAIN SCREEN FUNCTIONS

This paragraph describes the Main Screen. Operations are configured, started, and stopped using this screen. The main window includes the **Menu Bar**, **Toolbar**, and **Status Bar**. This window is comprised of three main views: the Hardware Status View, Environment View and the Mode Results View. The example below (see Figure 1-4) displays the screen during an Registration mode.

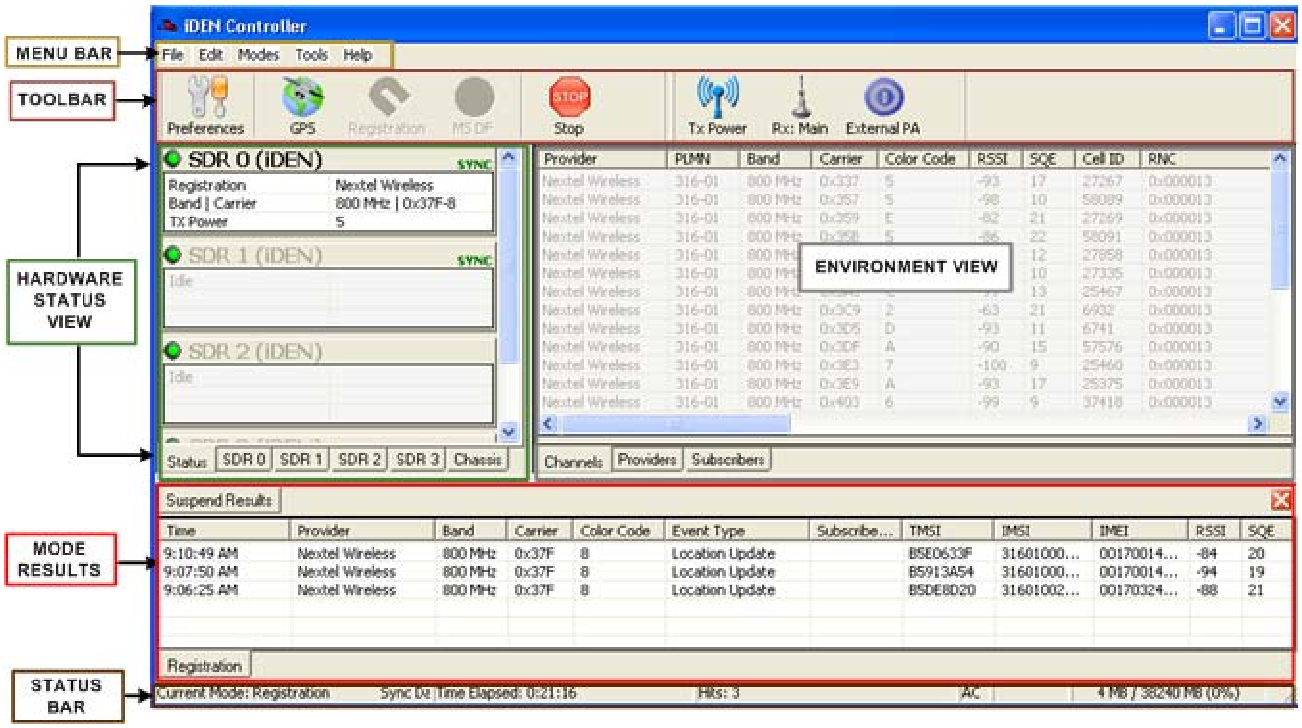


Figure 1-4. Main Screen Layout

1-4.1 MENU BAR

The menus available on the Menu bar are **File, Edit, Modes, Tools**, and **Help**. These menus are shown in Figure 1-5 and described in Table 1-1.



Figure 1-5. iDEN Transceiver Menu Bar

Table 1-1. iDEN Transceiver Menu Descriptions

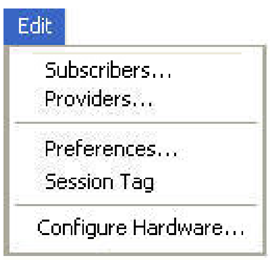
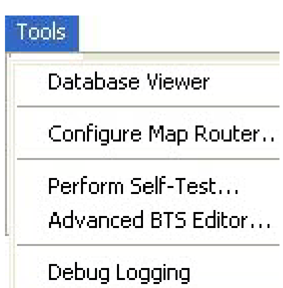
Name	Menu	Sub Menu	Function	Ref Para
File		**New Database**	Prompts the user to optionally save the current database, then clears any current data, effectively creating a new database	2-2.3
		Save Database As	The **Save As** window opens allowing the user to save the current database to a specified location	2-2.3
		Exit	Exit the iDEN Transceiver	—
Edit		**Subscribers**	Opens **Subscribers Management** dialog to allow the user to add, edit, remove, import, and export subscribers	1-5.1
		Providers	Update/create the service provider list	—
		Preferences	Opens **Preferences** window to allow the user to setup specific mode settings	1-8
		Session Tag	Opens **Set Session Tag** window allowing the user to label the current session	1-9
		Configure Hardware	Opens **Hardware Configuration** window	1-7
Mode		**Registration**	Opens **Start Registration** window allowing the user to configure and start the Registration mode	1-11
		MS DF	Opens **Start MS DF** window allowing the user to configure and start the MS DF mode	1-12
Tools		**Database Viewer**	Launches the **Database Viewer** for viewing and managing the database	2-2
		Configure Map Router	Opens the **Map Router Configuration** dialog for connecting the **iDEN Transceiver** to the Map Router application (a separate application).	2-3
		Perform Self-Test	Commands the SDRs to perform a self-test and confirm hardware functionality	2-11

Table 1-1. iDEN Transceiver Menu Descriptions (Continued)

Name	Menu	Sub Menu	Function	Ref Para
Tools (Cont)		**Advanced BTS Editor**	Emulates a Base Transceiver Station and provides the capability to configure specific transmitted parameters to increase the flexibility of transmit modes	1-11 1-12 2-12
		Debug Logging	When Debug Logging is enabled, critical system information is logged and stored for debug processing. It may reduce sytem performance. Only enable Debug Logging when instructed by the product support team.	—
Help		**About**	General information about the system, including software versions of loaded applications	1-13

1-4.2 TOOLBAR FUNCTIONS

The Toolbar allows the user access to preferences, different modes of operation, and mode specific actions. The toolbar buttons are shown and described in Table 1-2.

Table 1-2. Toolbar Buttons

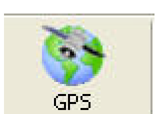
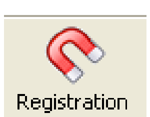
Button	Function
	Shortcut to **Preferences** window for general preferences and preferences for all modes
	Connects to or disconnects from a preconfigured GPS device
	Opens **Start Registration** window allowing the user to specify channels or providers to begin Registration and setup Registration preferences. The Registration button is only available in the Channels and Providers environment views

Table 1-2. Toolbar Buttons (Continued)

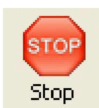
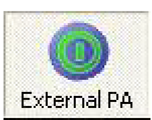
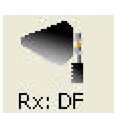
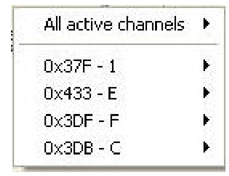
Button	Function
	Opens **Start MS DF** window, allowing the user to select subscriber on which to perform direction finding, allowing them to locate the subscriber by providing a bearing to the subscriber and the received signal strength
	Suspends Survey, setting the SDRs to idle. The **Suspend** button is only available while Survey is active
	Resumes Survey. The **Resume** button is only available while Survey is suspended
	Stops the current mode and returns to Survey. The **Stop** button is available during mode operation
 **Toggled Off (Default)**  **Toggled On (Enabled)**	The External PA button is only available when StingRay or KingFish is in use. It indicates the **Main** antenna is used for transmission. When clicked, it toggles from the default grey/blue **External PA** to green/blue **External PA** to indicate that the External PA port is being used for transmission
	**Rx: Main** Antenna selected. This button allows the user to toggle between **Main** and **DF** ports for receive during transmit operations
	**DF** Antenna selected. This button allows the user to toggle between **Main** and **DF** ports for receive during transmit operations. This icon appears when no AmberJack is connected to the system
	**DF** Antenna selected. This button allows the user to toggle between **Main** and **DF** ports for receive during transmit operations, when an AmberJack antenna is connected.

Table 1-2. Toolbar Buttons (Continued)

Button	Function
	**Tx Power** icon is displayed during transmit operations. At anytime during transmission, click the **Tx Power** button to open a menu to adjust power on a channel by channel basis 

1-4.3 STATUS BAR

The status bar displays the current power status state of the RayFish hardware as well as other pertinent information. Other information includes the number of channels detected during survey, timeline information, and current database size. The status bar will be further described in mode specific sections. The status bar is shown in Figure 1-4.

1-4.4 HARDWARE STATUS VIEW

The hardware status view provides the user with real-time status of the RayFish system, including detailed views for each SDR and the RayFish chassis. Some examples of the hardware status view are shown in Figure 1-6, Figure 1-7, Figure 1-8, Figure 1-10, and Figure 1-11.

The first example, Figure 1-6, shows SDR 0, SDR 1, and SDR 2 in Survey operation, while SDR 3 is idle.

The second example, Figure 1-7, shows detailed hardware information pertaining to SDR 1, including temperature, firmware, and calibration data. The iDEN PCC now detects and reports the presence of a corrupt calibration table within the RayFish platforms (see Figure 1-9). If a warning is generated, contact customer support immediately.

The third example, Figure 1-8, shows detailed information for the StingRay's chassis, and power status including RFD information. Similar information will be displayed for the KingFish also.

The fourth example, Figure 1-10, shows SDR 0, SDR 1, SDR 2, and SDR 3 in Survey operation. A PC Peripheral GPS is connected, along with a Harpoon, which is currently Muted.

The fifth example, Figure 1-11, shows detailed information for the StingRay II chassis, and power status including RFM information.

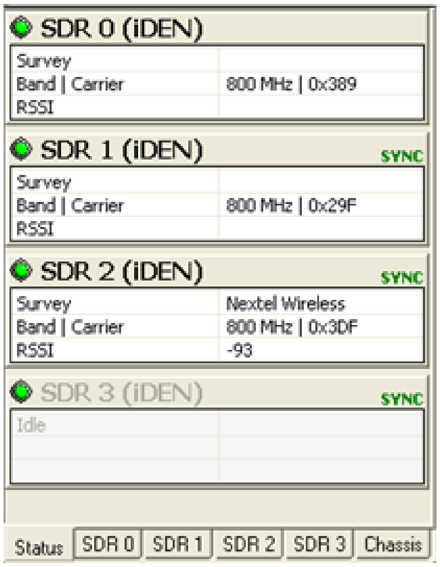


Figure 1-6. Hardware Status View (Status Tab)

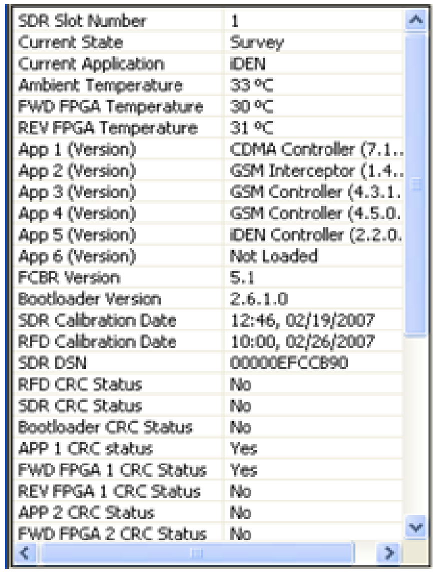


Figure 1-7. Hardware Status View (SDR 1 Tab)

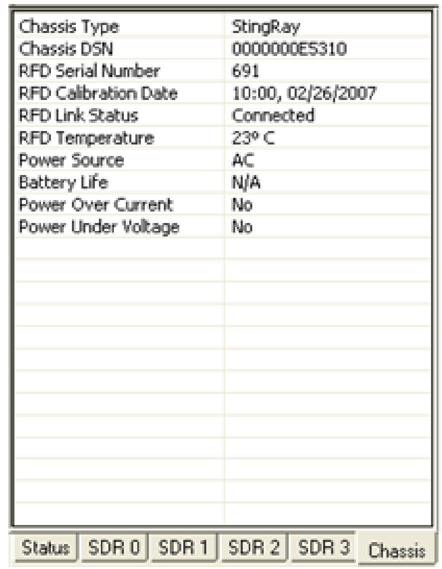


Figure 1-8. Hardware Status View (Chassis Tab)



Figure 1-9. Corrupt Calibration Table Warning

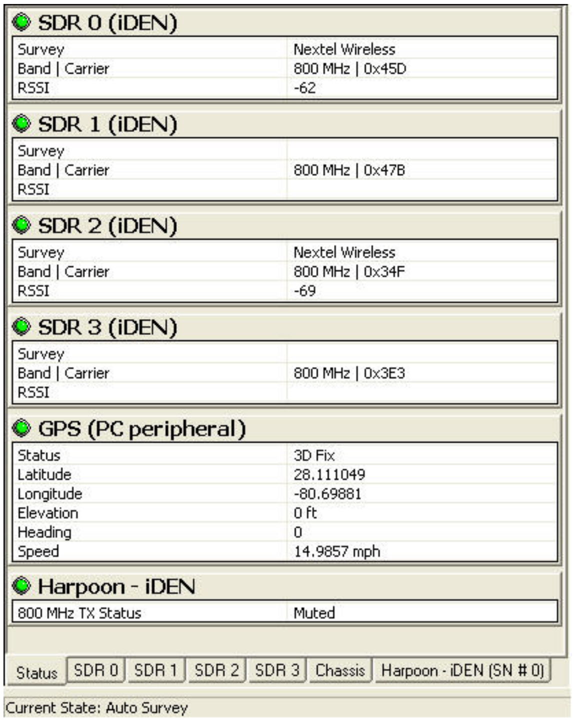


Figure 1-10. Hardware Status View With GPS & Harpoon (Status Tab)

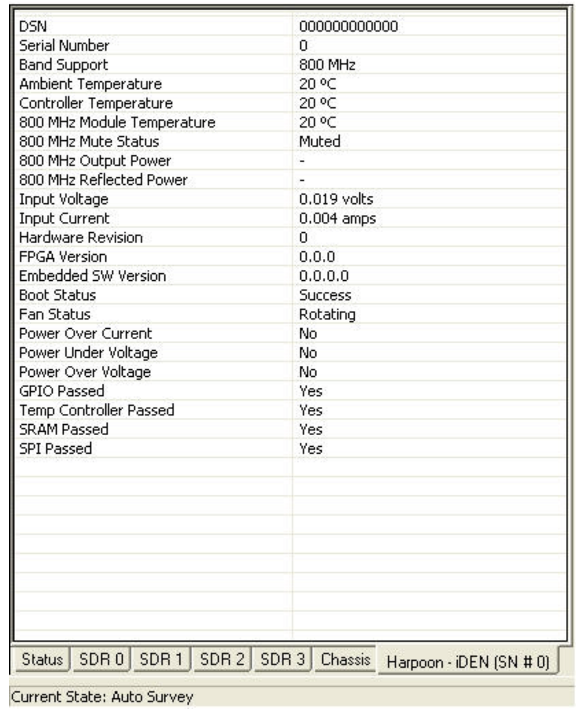


Figure 1-11. Hardware Status View (Harpoon Tab)

1-4.5 ENVIRONMENT VIEW

The environment view can be considered the central view of the iDEN Transceiver. The three tabs available in the environment view provide the user with important information, as well as an interface for selecting objects to start modes of operation. Data can be organized by adding or removing columns, moving and resizing columns within the display, and sorting columns by ascending or descending order. Specific details on using the environment view can be found in mode specific sections. Some examples of the view are shown below with brief descriptions.

The Channels view (see Figure 1-12) shows the channels and related channel information surveyed during Survey.

Provider	PLMN	Band	Carrier	Color Code	RSSI	SQE	Cell ID	RNC
Nextel Wireless	316-01	800 MHz	0x337	5	-103	11	27267	0x000013
Nextel Wireless	316-01	800 MHz	0x357	5	-98	9	58089	0x000013
Nextel Wireless	316-01	800 MHz	0x359	E	-79	21	27269	0x000013
Nextel Wireless	316-01	800 MHz	0x3D5	D	-94	8	6741	0x000013
Nextel Wireless	316-01	800 MHz	0x3DF	A	-93	11	57576	0x000013
Nextel Wireless	316-01	800 MHz	0x3E3	7	-100	11	25460	0x000013
Nextel Wireless	316-01	800 MHz	0x3E9	A	-95	16	25375	0x000013
Nextel Wireless	316-01	800 MHz	0x403	6	-96	11	37418	0x000013
Nextel Wireless	316-01	800 MHz	0x415	7	-98	13	6724	0x000013
Nextel Wireless	316-01	800 MHz	0x455	3	-90	17	25710	0x000013
Nextel Wireless	316-01	800 MHz	0x45B	C	-102	11	27304	0x000013
Nextel Wireless	316-01	800 MHz	0x479	2	-88	18	6387	0x000013
Nextel Wireless	316-01	800 MHz	0x47B	C	-85	21	27334	0x000013

Channels | Providers | Subscribers

Figure 1-12. Environment View - Channel Tab

The Providers view (see Figure 1-13) shows the providers that have been successfully surveyed.

Provider	PLMN	Num Carriers	
Nextel Wireless	316-01	26	

Channels | Providers | Subscribers

Figure 1-13. Environment View - Provider Tab

The Subscribers view (see Figure 1-14) shows the subscribers and identification information currently stored in the database.

Subscriber Tag	IMEI	IMSI	TMSI	PLMN
Green Boy	010000...	31601...	B5C5AA0E	316-01

Channels | Providers | Subscribers

Figure 1-14. Environment View - Subscribers Tab

1-4.6 MODE RESULTS VIEW

The mode results view displays the results of the operating modes to the user. For each mode executed, a tab will appear at the bottom of the view providing the user quick, organized access to the results data. As with the environment view, data can be organized by adding or removing columns, moving and resizing columns within the display, and sorting columns by ascending or descending order. Specific details on using the mode results view can be found in mode specific sections. Some examples of the view are shown below with brief descriptions. Results can be suspended to stop incoming results from scrolling off screen either by selecting the **Suspend Results** button or simply clicking anywhere on the results view. Select **Resume Results** to update with the incoming results (including those that were suspended.

The Registration results (see Figure 1-15) display the results logged by the StingRay during Registration.

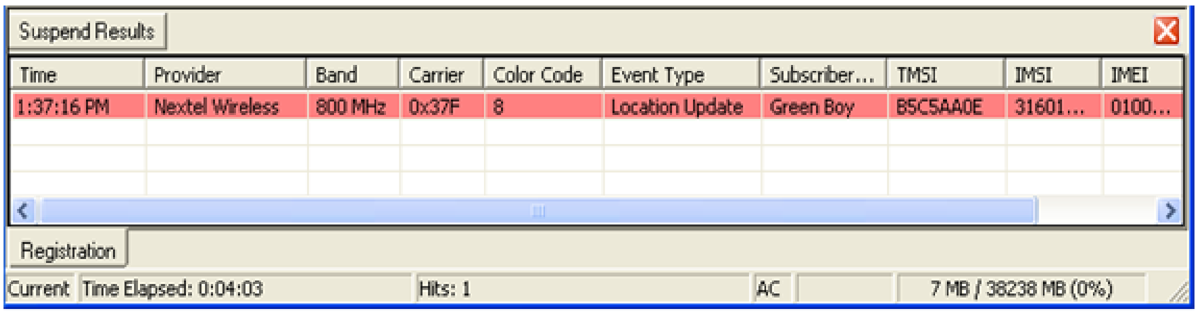


Figure 1-15. Results View - Registration Tab

1-5 SUBSCRIBERS

This section describes the iDEN Transceiver's ability to configure and maintain subscribers. Subscribers provide the user the ability to connect and locate activity through identification information.

The **Subscribers Management** dialog allows for display of active and inactive subscribers

- A subscriber can be added, edited, or removed
- A subscriber can also be added from the results view
- A subscribers list can be imported from a file
- A subscribers list can be exported to a file

1-5.1 SUBSCRIBERS MANAGEMENT

When the **Edit** menu and **Subscribers** is selected, the Subscribers Management window opens. Active and Inactive subscribers are displayed in their corresponding text areas. The **Subscribers Management** dialog is shown in Figure 1-16.

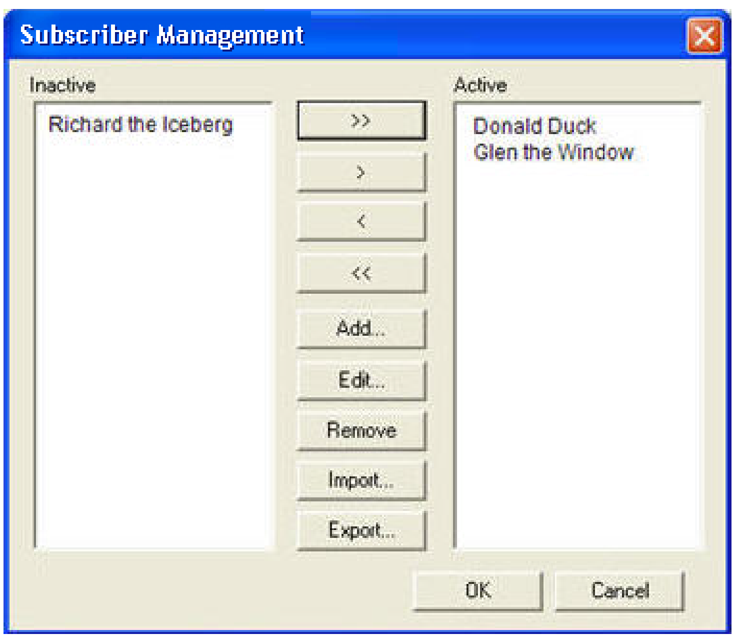


Figure 1-16. Subscribers Management Dialog

NOTE

Multiple subscribers can be selected by single-clicking on the desired rows while pressing the Ctrl key. Re-click on highlighted rows to deselect subscribers.

1-5.2 ADDING OR EDITING SUBSCRIBERS

Selecting **Add** from the Subscribers Management dialog displays the **Add Subscriber** dialog (see Figure 1-17).



Figure 1-17. Add Subscriber Dialog

Selecting an existing subscriber and **Edit** from the Subscribers Management dialog displays a populated **Add Subscriber** dialog that can be edited (see Figure 1-18).



Figure 1-18. Edit Subscriber From Add Subscriber Dialog

Table 1-3 describes the fields and buttons on the **Add** Subscriber dialog.

Table 1-3. Add Subscriber Fields and Buttons

Field/Button	Description
Tag	Name associated with the subscriber
	Specifies whether the subscriber is active or inactive. Inactive subscribers are not displayed in the subscribers environment view or matched in mode results
TMSI	The Temporary mobile Subscriber Identity as assigned by a Network. This ID is 8 digits long

Table 1-3. Add Subscriber Fields and Buttons (Continued)

Field/Button	Description
IMSI	The International Mobile Subscriber Identity as assigned by a Service provider. This ID is 15 digits long
IMEI	The International Mobile Equipment Identity as assigned by the manufacturer of a mobile station. This ID is 15 digits long
PLMNs	The Public Land Mobile Network values indicating the service providers with which the subscriber is associated
Add...	Opens Add Subscriber window, allowing user to associate a PLMN with the subscriber
Remove	Removes the selected PLMN from the subscriber's information
OK	Closes window and saves any changes made
Cancel	Closes window and does NOT save changes made
Help	Opens description of fields

The following procedure describes how to **Add** or **Edit** a **Subscriber**.

NOTE

> If subscriber information is known, subscriber should be added prior to mode operation.

Step 1. Connect and start the iDEN Transceiver (see Paragraph 1-3.1 for details).

Step 2. Select **Edit** menu and **Subscribers** to open the Subscribers Management dialog (see Figure 1-16).

Step 3. Select **Add** or **Edit** to open the Add (see Figure 1-17) Subscriber (see Figure 1-18) dialog.

Step 4. Supply or change the following information. Use Wildcard characters as appropriate (see Table 1-4):

NOTE

> Wildcards work only in non-subscriber modes.

a. **Tag** (Required) – Enter name or identifying information.
b. Active – Check to store subscriber as Active, deselect to store subscriber as Inactive.
   - **TMSI** – Enter the Temporary Mobile Subscriber Identity number
   - **IMSI** – Enter the International Mobile Subscriber Identity number
   - **IMEI** – Enter the International Mobile Equipment Identity number
   - **PLMNs** – Enter Public Land Mobile Network value

Table 1-4. How to Use Wildcards

Character	Description	Example	Explanation
% (percent)	Matches zero or more characters	310%	Matches all numbers that start with 310 and are within the allowed length
		%62204165	Matches all numbers that end with 62204165 and are within the allowed length
_ (underscore)	Matches a single character	125_5075	Matches all numbers that begin with 125, end with 5075 and have exactly 1 character in between
		___65075	Matches all numbers that end with 65075 and have exactly 3 characters before

Step 5. Click **OK** to store the entry and close the window or click **Cancel** to close the dialog without storing the subscriber.

NOTE

Subscribers can also be added directly from most views for mode results. By right-clicking on the desired result and selecting **Add to Subscribers List** the Add Subscriber window will open with the selected information populated.

1-5.3 IMPORTING SUBSCRIBERS

The following procedure describes how to import a list of subscribers from an existing subscribers file (tgt).

Step 1. Click **Import** in the Subscribers Management dialog (see Figure 1-16). The **Open** window will appear (see Figure 1-19).

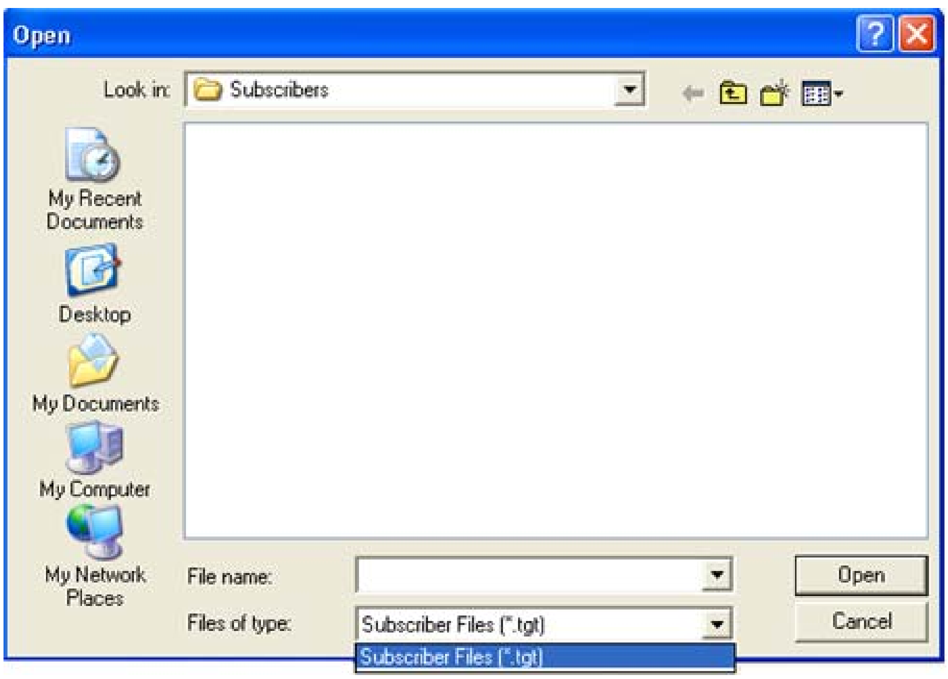


Figure 1-19. Browse for Subscriber File

Step 2. Browse to the desired directory and select the desired ***.tgt** or ***.csv** file to import.

Step 3. Select **Open** and then **Yes** from the dialog prompt to confirm the import.

NOTE

Importing subscribers overwrites any and all existing subscribers stored in the database.

1-5.4 EXPORT SUBSCRIBERS

The following procedure describes how to export subscribers to a subscribers file (.tgt).

Step 1. Click **Export** in the **Subscribers Management** dialog (see Figure 1-16). The **Save As** window will appear (see Figure 1-20).

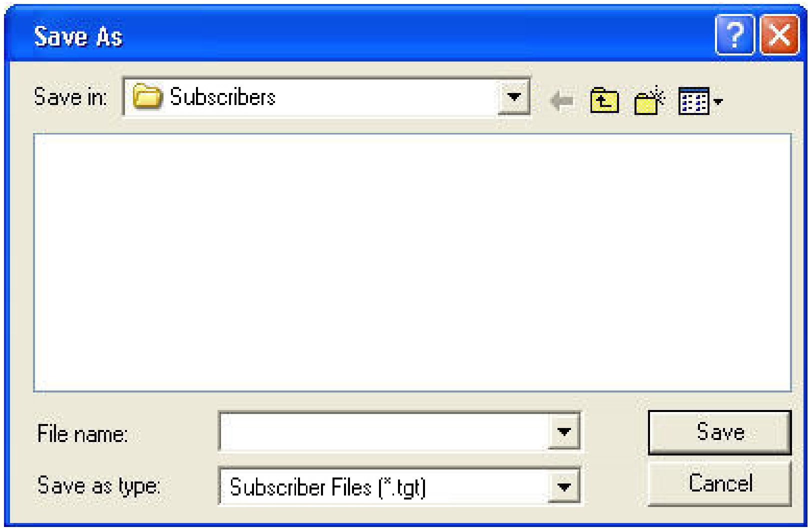


Figure 1-20. Export Subscribers from Save As Window

Step 2. Browse to the desired directory and choose an appropriate name for the subscribers file to which you are going to export.

Step 3. Select **Save** from the window prompt to confirm the export.

NOTE

The **Save As** defaults to the subscribers folder in the following Location: <C:\Documents and Settings\All Users\Documents\WPG\Protocols\iDEN\Subscribers>

1-6 PROVIDERS CONFIGURATION

This section describes the iDEN Transceiver ability to configure and maintain the Providers from the Provider Management window accessed via **Edit>Providers** (see Figure 1-21).

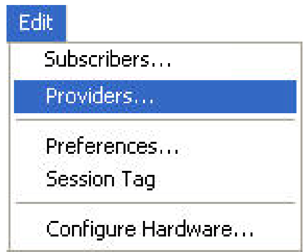


Figure 1-21. Edit Providers

1-6.1 PROVIDER MANAGEMENT

When the **Edit** menu and **Providers** is selected, the **Provider Management** window opens. The buttons are shown in Figure 1-22 and described in Table 1-5.

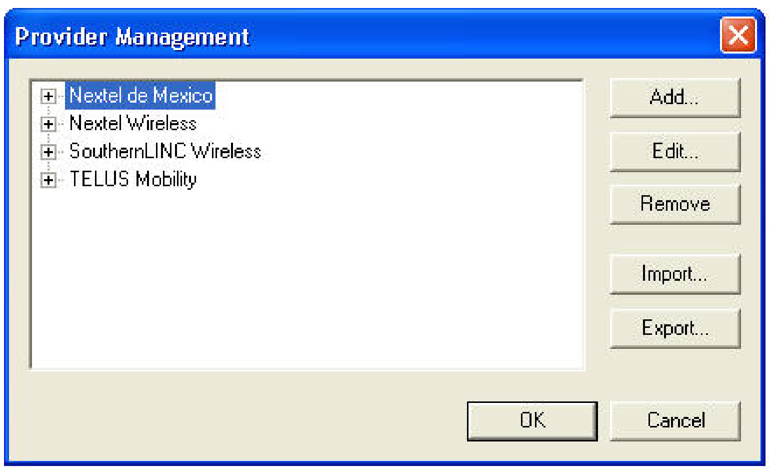


Figure 1-22. Provider Management Window

NOTE

The iDEN Transceiver is preloaded with the providers shown in Figure 1-22

Table 1-5. Provider Management Window Buttons

Button	Function
	Allows the user to **Add** a new record corresponding to the current Provider
	Allows the user to **Edit** a new record corresponding to the current Provider

Table 1-5. Provider Management Window Buttons (Continued)

Button	Function
Remove	Removes the selected record
Import...	Allows the user to **Import** a new record corresponding to the current Provider
Export...	Allows the user to **Export** a new record corresponding to the current Provider
OK	Closes the **Provider Management** window and saves any changes
Cancel	Closes the **Provider Management** window and does not save any changes

1-6.1.1 Add Provider

Select the **Add** button from the **Provider Management** dialog (see Figure 1-22) to open the **Add Provider** dialog (see Figure 1-23). Adding a provider requires prior knowledge of the service provider's PLMNs.

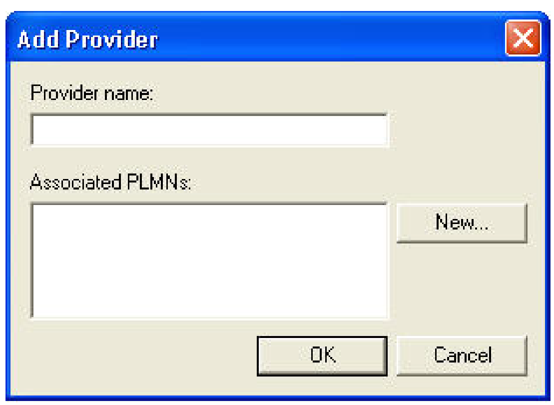


Figure 1-23. Add Provider Dialog

Select **New** button in the **Add Provider** dialog to open the **Add PLMN** dialog (see Figure 1-24) and associate a SID with the specified Provider's name. Select **OK** to save the new entry and close the **Add Provider** dialog.



Figure 1-24. Add PLMN

1-6.1.2 Edit Provider

Select a provider from the **Provider Management** dialog (see Figure 1-22) and then select the **Edit** button to open **Edit Provider** dialog (see Figure 1-25) to edit the selected provider.

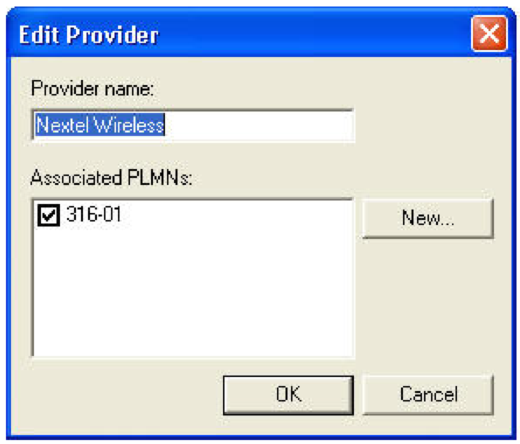


Figure 1-25. Edit Provider Entries

Select **New** button in the **Edit Provider** dialog (see Figure 1-25) to open the **Add PLMN** dialog (see Figure 1-24) to associate additional PLMNs with the selected Provider. Edit the current associated PLMN by clicking on the PLMN and editing as desired. Select **OK** to save changes and close the **Edit Provider** dialog.

1-6.1.3 Remove Provider

Select a provider from the **Provider Management** dialog (see Figure 1-22) and then select the **Remove** button. A dialog opens (see Figure 1-26) asking if you are sure you want to delete this provider. Select **Yes** to delete the provider from the list.

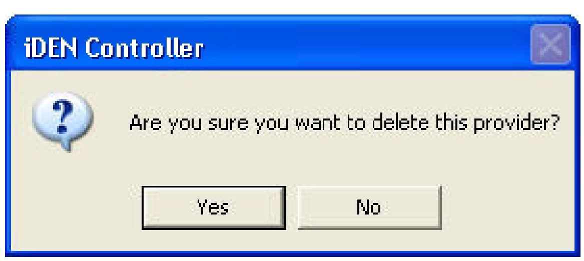


Figure 1-26. Delete Provider

1-6.1.4 Import Providers

The following procedure describes how to import a list of providers, overwriting the existing file.

Step 1. Select **Edit > Providers** to display the **Provider Management** window.

Step 2. Click **Import** in the **Provider Management** window and browse to the appropriate directory and select the desired .pvd file to import.

Step 3. Select **Open** and then **Yes** from the prompt to confirm the import.

1-6.1.5 Export Providers

The following procedure describes how to export existing providers to a new file (*. pvd). Exporting to a new file name or location creates a backup of the information in the existing file.

Step 1. Select **Edit > Providers** to display the **Provider Management** dialog.

Step 2. Select **Export** from the **Provider Management** dialog. The **Save As** window appears (see Figure 1-27).

Step 3. Browse to the desired directory and choose an appropriate name for the provider file that is being created.

Step 4. Select **Save** from the window prompt to confirm the export.

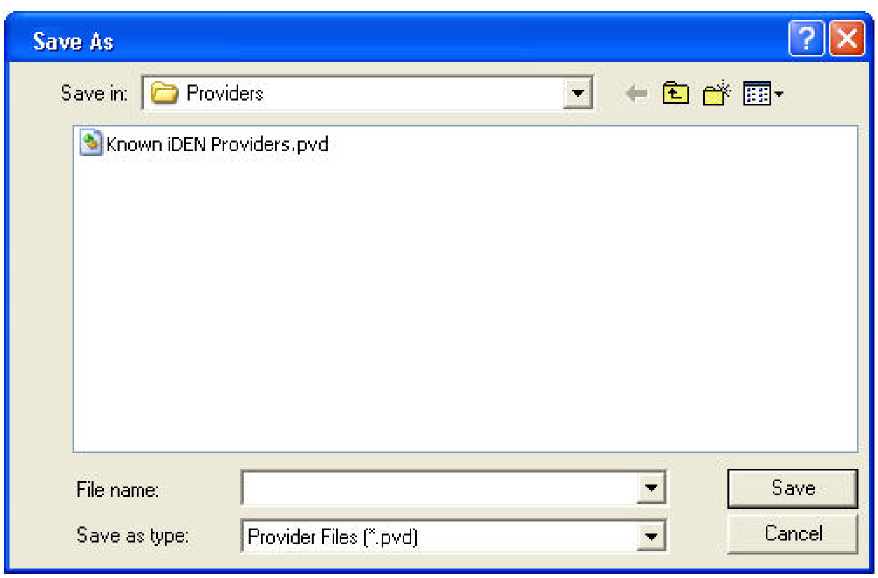


Figure 1-27. Export Providers From Save As Window

NOTE

The **Save As** defaults to the Providers folder in the following Location: <C:\Documents and Settings\All Users\Documents\WPG\Protocols\iDEN\Providers>

1-7 CONFIGURE HARDWARE

This section describes the iDEN Transceiver's ability to configure associated hardware including the GPS device.

Step 1. Select **Configure Hardware** from the **Edit** menu on the iDEN Transceiver Toolbar (see Figure 1-28). The Hardware Configuration dialog appears.

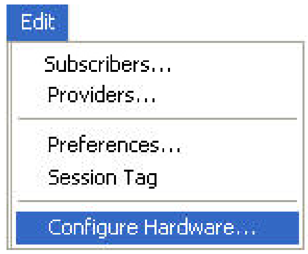


Figure 1-28. Configure Hardware Menu Selection

Step 2. Select the **Configure** button on the **Hardware Configuration** dialog to configure the **GPS** connection by launching the **Initialize GPS Wizard**. Figure 1-29 illustrates the **Hardware Configuration** tab available when using the StingRay or KingFish.



Figure 1-29. Hardware Configuration Dialog (StingRay/KingFish)

Step 3. When using a StingRay II, the **Hardware Configuration** dialog offers two additional tabs: the **Antennas** tab and the **Fans** tab (see Figure 1-30).

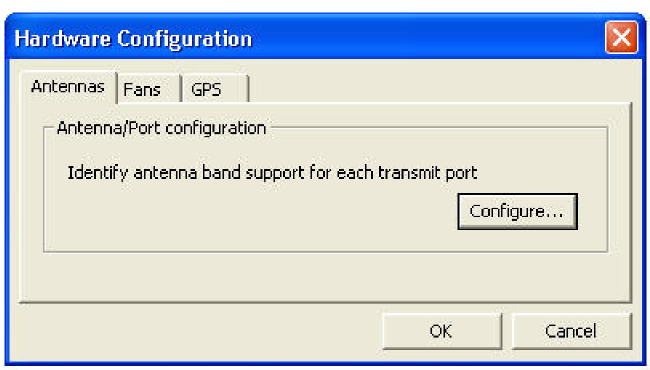


Figure 1-30. Hardware Configuration Dialog (StingRay II)

Step 4. Select the **Configure** button on the **Antennas** tab to display the **Configure Ports** dialog (see Figure 1-31). The user can select the Tx Port they wish to have a transmit antenna connected to. By default, the transmit port is set to Tx Port 1. When no Power Amplifier is connected, **Undetected** is displayed in the **PA** column. If a Power Amplifier is connected, configure the transmit ports accordingly by selecting a port that is not currently in use. Click **OK** to accept changes and **Close**.

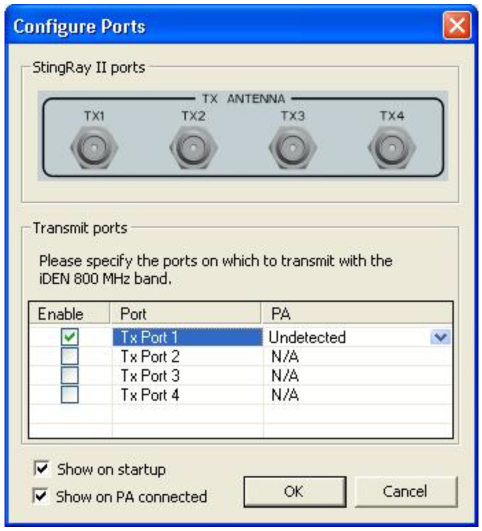


Figure 1-31. Configure Ports

Step 5. The **Fans** tab displays the options available to the user for controlling the fans of the StingRay II (see Figure 1-32). **System controlled** is the default set by the system. The user may choose to change this setting. The fans can be set to run at full speed or to be turned off. Additionally, this setting affects how the Harpoon fans run if the Harpoon is connected.

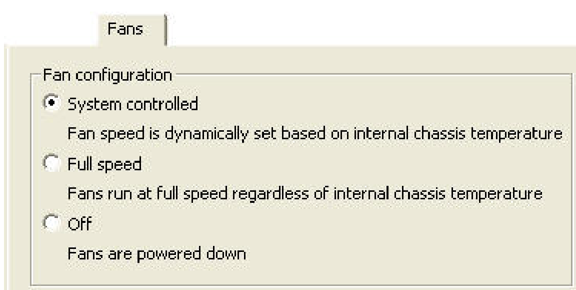


Figure 1-32. Fans Tab

Step 6. The **GPS** tab displays the two GPS configurations available to the user. When a StingRay II is connected, the option to use the StingRay II's internal GPS will be available to the user, otherwise, the default is always the PC peripheral. The PC peripheral option allows the user to configure an external GPS, either using bluetooth (pre-configured com port required) or USB. When the StingRay II internal GPS is selected the **Configure** button is grayed out (see Figure 1-33).

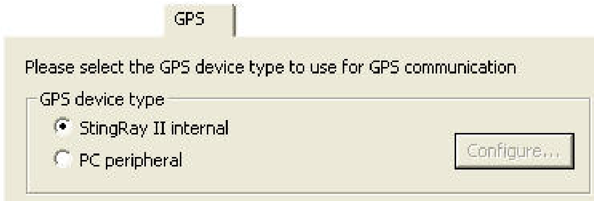


Figure 1-33. StingRay II GPS Tab

1-7.1 GPS CONFIGURATION

Before connecting to a PC Peripheral GPS device, the user should configure the GPS connection to ensure a faster and more accurate connection. Utilizing a GPS device in conjunction with the iDEN Transceiver allows the user to view and store geocoded data.

The **Configure** button on the **Hardware Configuration** dialog launches the **GPS Configuration** dialog (see Figure 1-34).

- Follow the instructions on the dialog and then click **OK**

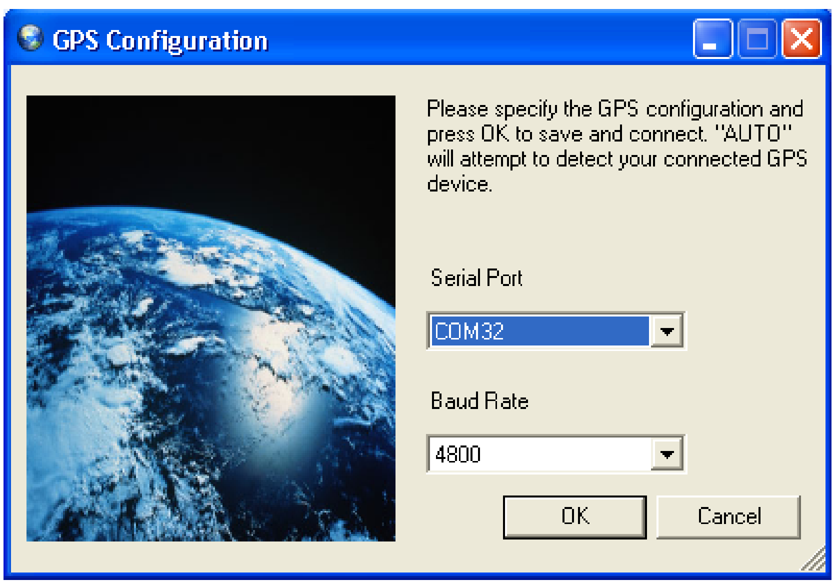


Figure 1-34. GPS Connection

1-8 PREFERENCES

The iDEN Transceiver preferences allow the user to configure settings for each operating mode as well as set up audible alerts and highlighting. To open the **Preferences** dialog (see Figure 1-35), select the **Edit** menu and **Preferences**.

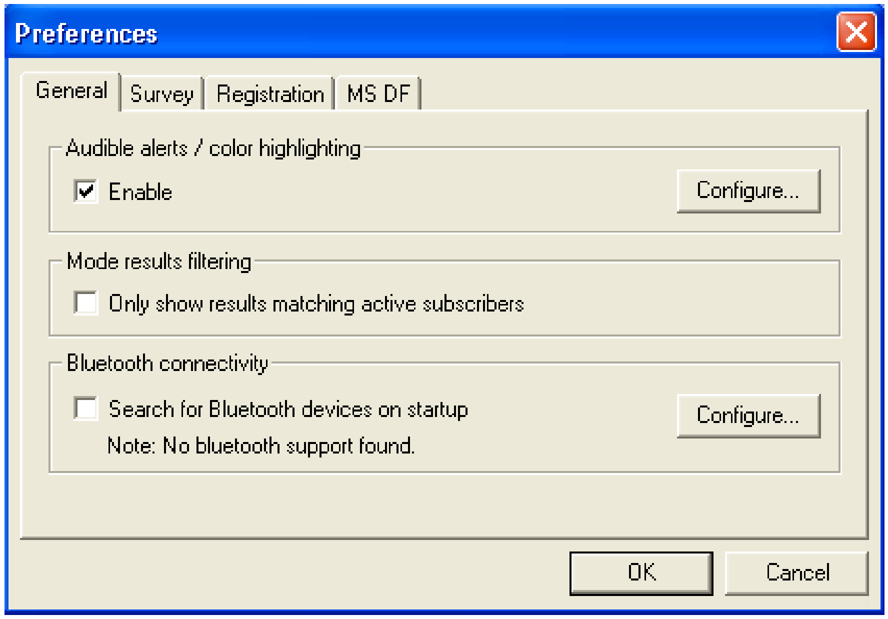


Figure 1-35. Preferences Dialog

NOTE

It is important to note that some preferences configured during mode operation may not take effect immediately, but instead when the mode is restarted.

1-8.1 GENERAL

The **General** preferences tab allows the user to define preferences having an effect on the entire application. To enable audible alerts and color highlighting, select the checkbox (see Figure 1-36).

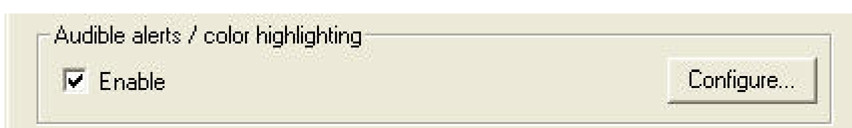


Figure 1-36. Audible Alerts/Color Highlighting Enabled

To enable filtering in all modes, only showing results matching active subscribers, select the checkbox (see Figure 1-37).



Figure 1-37. Enable Filtering In All Modes

Select the **Configure** button to open the **Event Configuration** dialog (see Figure 1-38).

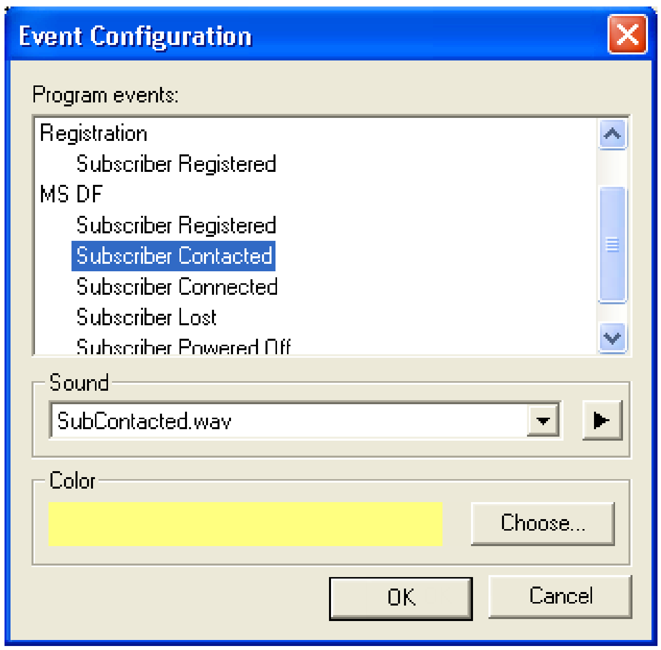


Figure 1-38. Event Configuration Dialog

Several events pertaining to each mode are shown in the Event Configuration dialog. To associate a **sound** with an event select the event and select a sound from the Sound menu (Figure 1-39). By default, the iDEN Transceiver is pre-configured to alert the user with voice sounds representing each event. Sounds can be previewed by clicking on the play button.

NOTE

Additional sounds can be manually added by moving any *.wav file into the following folder: <C:\Documents and Settings\AllUsers\Documents\WPG\Global\Sounds>.

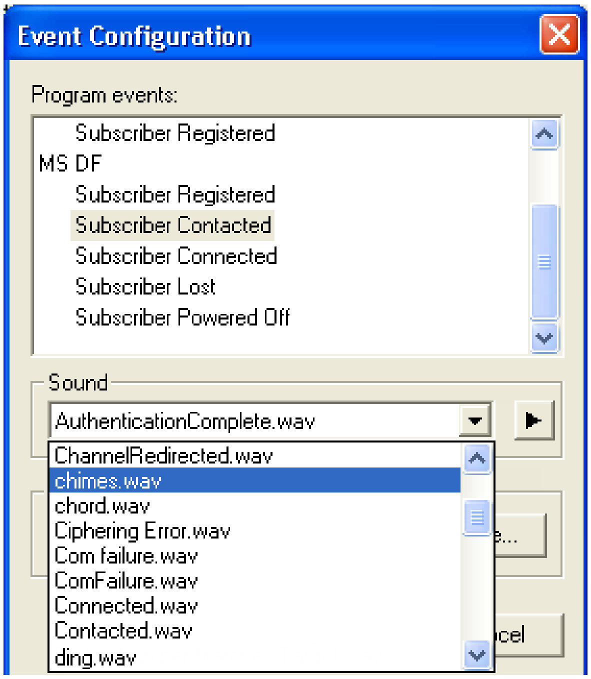


Figure 1-39. Select a Sound



Figure 1-40. Color Dialog

To highlight events as they appear in each mode's results view, select the desired event and click the **Choose** button located in the Color section of the **Event Configuration** dialog. The **Color** dialog (see Figure 1-40) will open and the user can select from the provided basic colors or create a custom color.

When all of the desired events have been configured for audible alerts and color highlighting, click the **OK** button in the **Event Configuration** dialog to save changes and return to the **Preferences** dialog.

General preferences provides the ability to enable searching for Bluetooth devices upon start of the application (see Figure 1-41).



Figure 1-41. Bluetooth Connectivity Dialog

Step 1. Select the **Configure** button to open the **Bluetooth Preferences** dialog (see Figure 1-42).

Step 2. Click the **Restore** button to automatically populate the default **Passkey**. (The KingFish default Passkey is 8675309)

Step 3. Click **OK** to accept the **Bluetooth Preferences** settings.

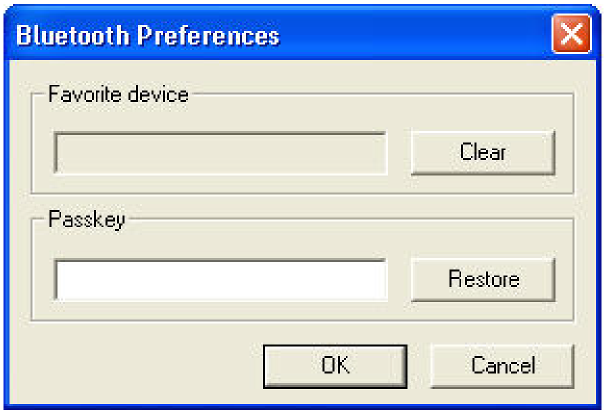


Figure 1-42. Bluetooth Preferences Window

1-8.2 SURVEY

The **Survey** tab of the **Preferences** dialog allows the user to configure settings for the Survey State. For details on setting Survey preferences refer to Paragraph 1-10.1.

1-8.3 REGISTRATION

The **Registration** tab of the **Preferences** dialog allows the user to configure settings for the **Registration** mode operation. For details on setting **Registration** preferences, refer to Paragraph 1-11.1.

1-8.4 MOBILE STATION DIRECTION FINDING (MS DF)

The **MS DF** tab of the **Preferences** dialog allows the user to configure settings for the **MS DF** mode operation. For details on setting **MS DF** preferences refer to Paragraph 1-12.1.

1-9 SESSION TAG

The iDEN Controller allows the user to label a session of data logging. For example, specific operations may be labeled to reflect the location of the operation. Applying session tags can be a useful tool for post-processing and organizing stored information.

1-9.1 SETTING THE SESSION TAG

When **Session Tag** is selected from the **Edit** menu, the **Set Session Tag** dialog opens. The dialog is shown in Figure 1-43 and described below.



Figure 1-43. Set Session Tag Dialog

- To tag the current session, enter a name or identifying information and click the **OK** button
- This will change replace any existing session tag
- The current session tag is displayed in the status bar (showing all the time) and is an available field in the results view of each operating mode

1-10 SURVEY

When the iDEN Transceiver is started, Survey automatically executes and characterizes the local iDEN network environment. A Base Station Survey, specific to the operation location, should always be performed prior to execution of a mode. In addition to logging network parameters, RayFish system uses the Base Station Survey to display available channels for the user to select in other modes of operation. A real-time display of survey results is provided. All survey results are saved in the database and may be viewed using the Database Viewer.

1-10.1 SURVEY PREFERENCES

Survey preferences can be configured, allowing the user to select the bands of interest and the power level thresholds for the configured operation (see Figure 1-44). It is important to note that survey preferences configured during operation will not take effect immediately, but instead when a new survey iteration begins. All preferences will be remembered during subsequent launches of the iDEN Transceiver.

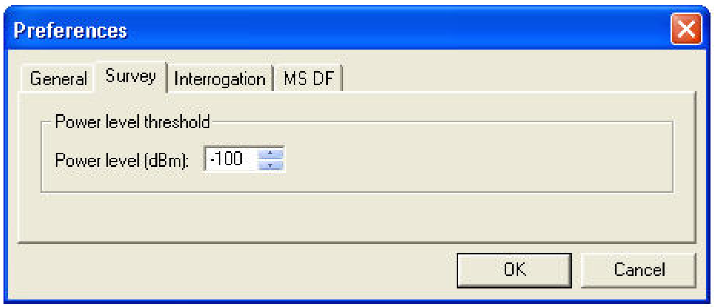


Figure 1-44. Survey Preferences

1-10.2 SURVEY OPERATION

Survey can be suspended and resumed by selecting the corresponding buttons on the toolbar (see Figure 1-45 and Figure 1-46).



Figure 1-45. Suspend Button



Figure 1-46. Resume Button

During Survey, the SDRs will cycle through Idle, Channel Scan (see Figure 1-47) and Survey states (see Figure 1-48).



Figure 1-47. SDRs Idle/Channel Scan

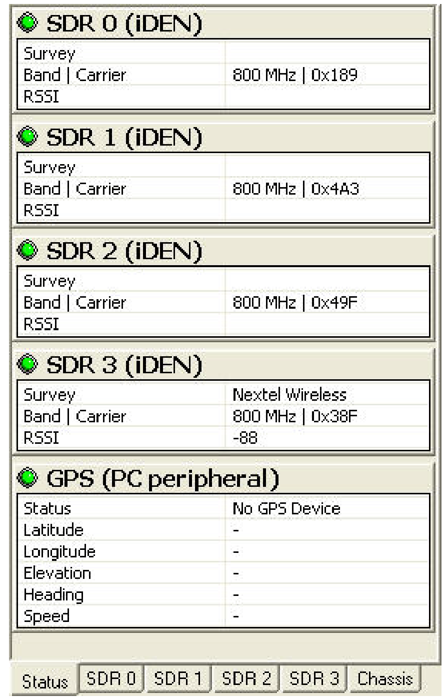


Figure 1-48. SDRs Surveying

1-10.3 SURVEY RESULTS

The Survey results are displayed in the Environment View. Table 1-6 describes the data columns available in the Survey results.

- The **Channels** tab (see Figure 1-12) displays one row for every channel surveyed, while the ***Providers*** tab (see Figure 1-13) displays one row for every provider in the current environment
- The displayed data can be organized by adding or removing columns, moving columns within the display, and sorting columns by ascending or descending order. It is recommended, the user sort by RSSI (max RSSI at top) and select the top row or top 3 rows when using a StingRay II.

Table 1-6. Survey Results Data Columns

Column	Example	Explanation
Provider	Nextel Wireless	Name of the Service Provider
PLMN	316-01	Public Land Mobile Network
Band	800 MHz	Frequency range utilized for transmission
Carrier	0x429	Carrier Number (in hex) corresponding to the frequency of the iDEN Base Station
Color Code	F	Unique identifier for each carrier
RSSI	-82	Received Signal Strength Indicator
SQE	20	Signal Quality Estimate
Cell ID	6932	Base Station identity with a local area
RNC	0x000013	Regional Network Code
SPC	0x00020058	Service Provider Code
SAID	3	Service Area Identifier
Local LAI	1421	Local Area Identifier
Cell Barred	Yes	Indicates if a network or cell has been set to “barred.” This occurs when a device or network is locked down or a user’s access needs to be limited.
Public Cell	Yes	Indicates the availability of the cell to mobile devices
Neighbors	0x161-3(2222)	Neighbor Carriers - Color codes (Desirability Factors)

Right Click in the **Environment View** displays a pop-up menu (see Figure 1-49).



Figure 1-49. Clear and Restart

- **Clear and Restart –** This clears the data from the **Environment View** and restarts the **Survey**

- **Show in Advanced BTS Editor** – This launches the **Advanced BTS Editor** dialog

NOTE

Analyze Neighbors (see Figure 1-49) is available when using a StingRay or StingRay II. Refer to Paragraph 2-14 for details.

1-10.4 SURVEY PROGRESS BAR

The **Survey Progress Bar** shows the progress of both the Channel Scan and the Survey. During the channel scan the user will see where the system is during the 1200 carrier channel scan. After the channel scan is complete the survey progress bar will then display where the system is during the survey. This will continue to switch between both views until the survey is suspended, restarted or during a transmit mode.

- Survey Progress Bar is displayed on the Status Bar. It shows the number and percentage of channels surveyed (see Figure 1-50)



Figure 1-50. Survey Progress Bar

1-11 REGISTRATION

The Registration mode attempts to log registrations from iDEN mobile stations (MS) that are within range of the RayFish system. The RayFish system emulates the weakest surveyed neighbor(s) of the strongest surveyed iDEN Channel(s). If survey data is unavailable, the operator can define **Advanced BTS Parameters** in order to maximize the number of mobile stations that register. The RayFish system transmits modified system information messages, including a modified **Location Area Identifier** (LAI) causing an MS to execute a location update. During this process, the RayFish will register the MS to obtain specific IMSI, TMSI, and IMEI information from each MS.

During the Registration mode, a real-time display of each Registration result is provided. Color-coded highlighting and optional audible indicators alert the operator when a registration matching a subscriber in the **Subscribers List** occurs. All Registration results are saved in a database and may be viewed using the **Database Viewer** utility included with the software.

1-11.1 REGISTRATION PREFERENCES

There are a number of Registration Preferences that can be setup prior to the start of a Registration and a limited number that can be changed during a Registration process. It is important to note that Registration preferences changed in the **Preferences** dialog (see Figure 1-51) or the **Start Registration** dialog (see Figure 1-52 or Figure 1-53) become the default startup settings. Any preferences changed during a Registration process will not take effect immediately, but instead when the Registration process is restarted. All preferences will be remembered during subsequent launches of the iDEN Transceiver.

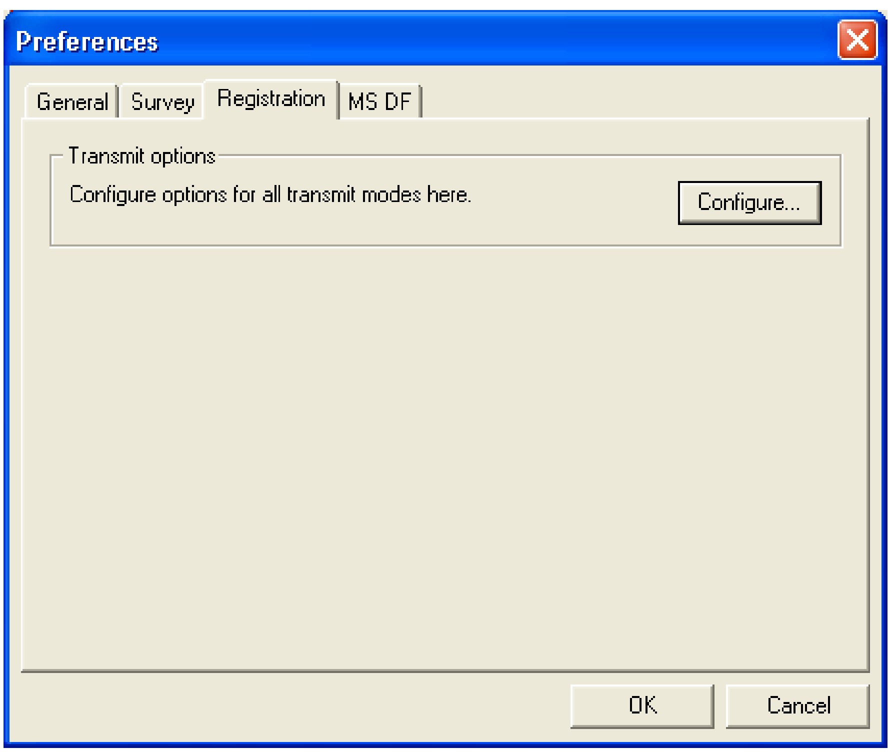


Figure 1-51. Registration Preferences

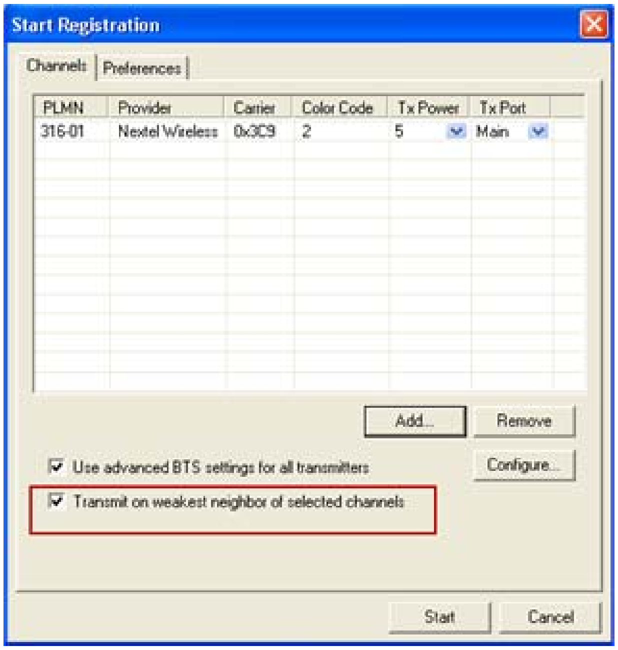


Figure 1-52. Start Registration (StingRay/ KingFish)

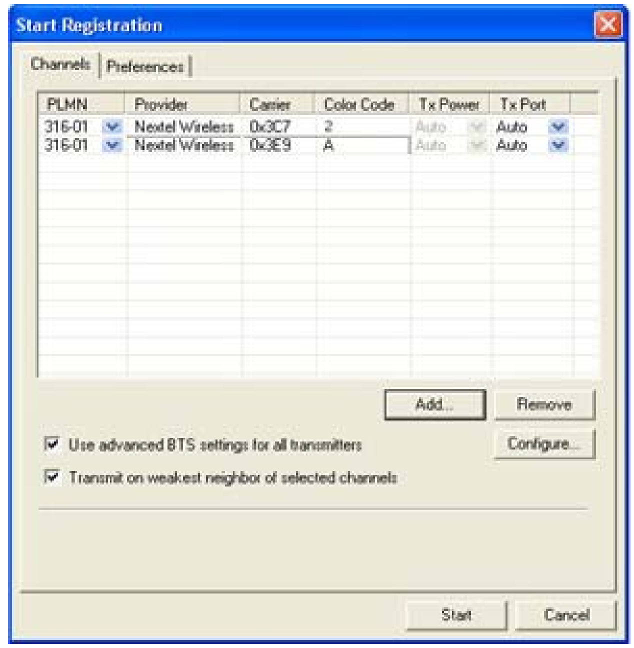


Figure 1-53. Start Registration (StingRay II)

1-11.1.1 Transmit Options

There are Transmit Options that can be configured prior to the start of a Registration. The following preferences can be accessed from either the Preferences dialog (see Figure 1-51) or the Start Registration dialog (see Figure 1-52 or Figure 1-53).

1-11.1.2 Power Options

When using a StingRay I or a KingFish, the user has the ability to change the default power level from 5-1 (with 5 being the max), stepping the transmit power in 3dB increments/decrements. The user can choose to enable the external PA port as the default transmit port, if an external power amplifier is to be used (see Figure 1-54).

When using a StingRay II, the user has the ability to let the system control the power level (see Figure 1-55). Automatic power balancing is a system controlled method that sets the transmit power of the SDRs to the optimal power level based on the number of active transmissions. The user can choose to override this feature and set a static transmit power regardless of the number of active transmissions. However, disabling this feature is not recommended, as it may cause poor transmit quality.

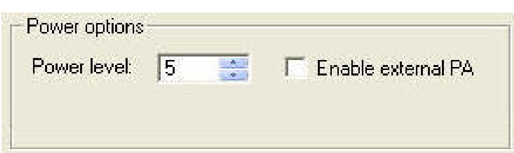


Figure 1-54. Power Options (StingRay/ KingFish)



Figure 1-55. Power Options (StingRay II)

1-11.1.3 Display Options

The user can choose whether or not to display the transmission dialog before starting the Registration. The **Display options** are illustrated in Figure 1-56.

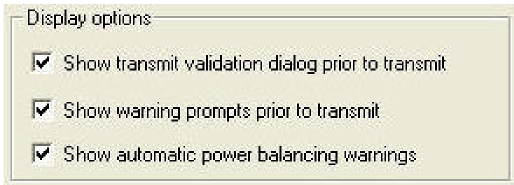


Figure 1-56. Display Options

A sample transmission warning dialog is displayed in Figure 1-57.

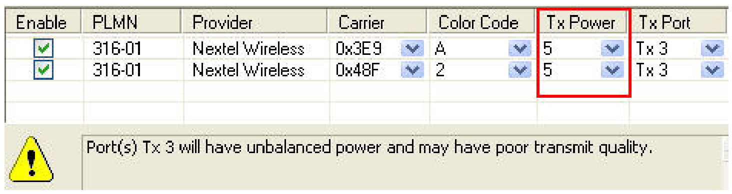


Figure 1-57. Tx Power Unbalanced (StingRay II)

1-11.2 REGISTRATION OPERATION

Registration can be started through three methods:

- Selecting one or more Carriers from the **Channels** tab in the environment view
- Selecting one or more Providers from the **Providers** tab in the environment view
- Selecting one or more Carriers from the **Analyze Neighbors** results

The following procedure describes how to operate the Registration mode:

Step 1. Select one or more desired Carriers from the **Channels** tab in the environment view, the Neighbor Analysis view, or select one or more Providers from the Providers tab in the environment view (use Ctrl + Click to select multiple rows).

Step 2. Click the **Registration** button on the iDEN Transceiver toolbar. The **Start Registration** window (see Figure 1-58 or Figure 1-59) opens. The channel(s) selected in the environment view are listed under the **Channels** tab.

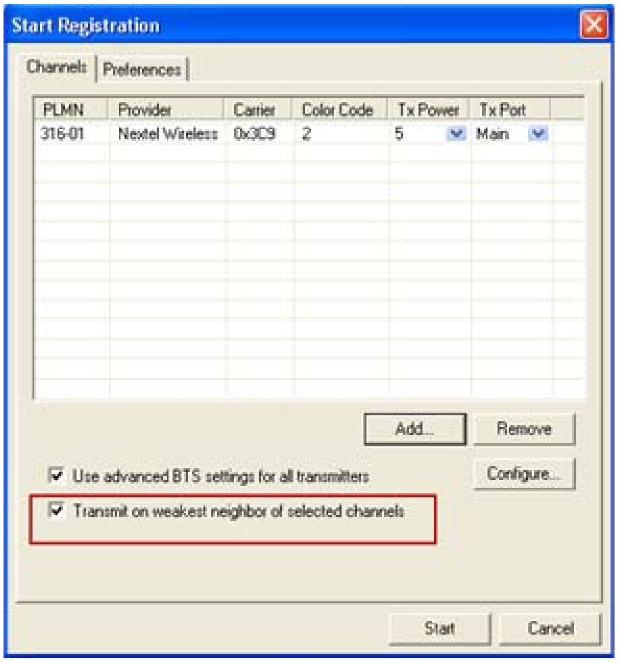


Figure 1-58. Start Registration (StingRay/ KingFish)

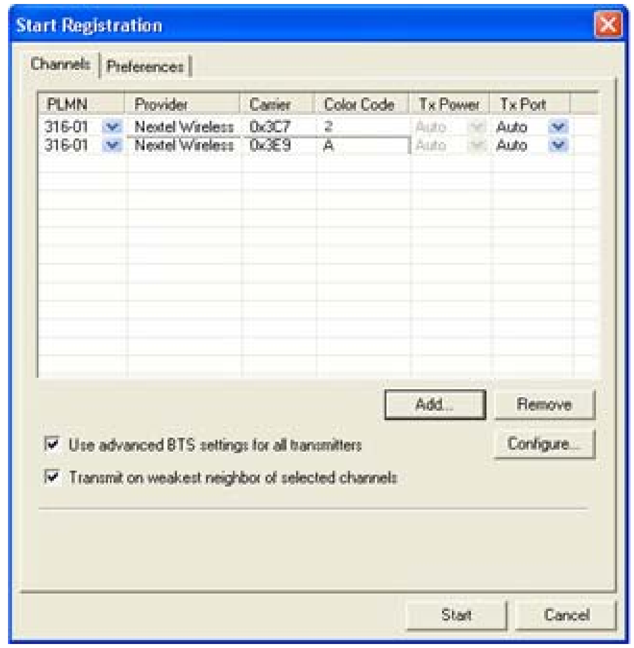


Figure 1-59. Start Registration (StingRay II)

Step 3. When the checkbox for **Use Advanced BTS settings for all transmitters** is selected, the **Configure** button is available. The PLMN will have a value and the Provider will be displayed in the column.

Step 4. Select the **Configure** button to open the **Advanced BTS Parameters** window (see Figure 1-60).

- Use these parameters (see Table 1-7) to emulate a base station
- All fields are required
- The RayFish system will transmit the values specified for each of the elements
- Select the **Help** button for detailed explanations of each field

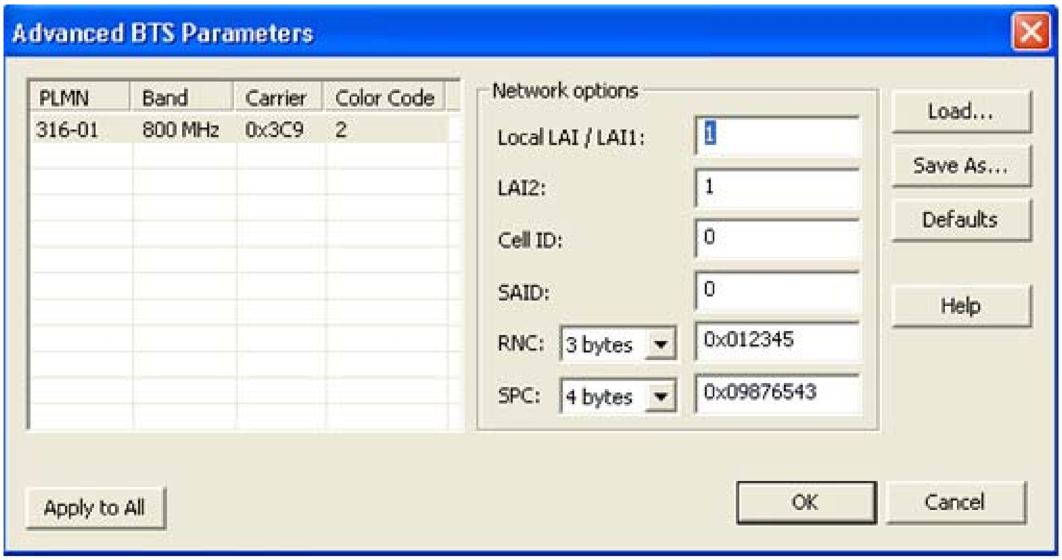


Figure 1-60. Advanced BTS Parameters Window

Table 1-7. Advanced BTS Parameters Description

Field/Button	Explanation
PLMN	Public Land Mobile Network (Combination of Mobile Country Code (MCC) and Nationwide Direct Connect (NDC) codes
Band	Frequency range used for transmission
Carrier	Channel/carrier number, listed in hex format
Color Code	An identification affiliated with each channel, making each channel unique. Neighboring base stations will have different color code pairs assigned to their channels.
Local LAI1	Local Area Identifier/Local Area Identity 1. The **LAI1** is equal to the **Local LAI** and identifies a set of Base Stations within a geographical area. This number can range from 1 to 65534.
LAI2	Local Area Identifier/Local Area Identity 2. The **LAI2** also identifies a set of Base Stations within a geographical area. This number can range from 1 to 65534.
Cell ID	The **Cell ID** identifies a Base Station within a local area. This number can range from 0 to 65535.
SAID	Service Area Identifier. The **SAID** identifies a set of one or more Location Areas. This number can range from 0 to 255.

Table 1-7. Advanced BTS Parameters Description (Continued)

Field/Button	Explanation
RNC	Regional Network Code. This number can range from 0 to (2^35-1). Specify the **RNC** in hex. It must start with **0x**.
SPC	Service Provider Code. This number can range from 0 to (8 * 2^32-1). Specify the **SPC** in hex. It must start with **0x**.
Load	Loads BTS parameters from a file (if available)
Save As	Saves selected BTS parameters (*.abc.iden filename extension)
Defaults	Loads default BTS parameters (NOTE: This function will overwrite BTW parameters for selected fields)
Help	Displays chassis, PC version, and SDR information
Apply to All	Apply options to all Carriers/channels in the list
OK	Accepts changes and closes the window
Cancel	Closes the window without accepting changes

Step 5. Edit the fields and select **OK** to return to the **Start Registration** window.

NOTE

The user can select as many channels as there are transmitters. Examples:

- KingFish has one Software-Defined Radio (SDR) and up to one transmit channel
- StingRay I has four SDRs and up to one transmit channel
- StingRay II has four SDRs and up to four transmit channels

- To remove a channel or provider, select the row and click the **Remove** button (use Ctrl + Click to select multiple rows)
- To manually add a channel or provider not already listed, click the **Add** button. This will open the **Add Channel** dialog (see Figure 1-61) or **Add PLMN** dialog (see Figure 1-62)
- The **Carrier** and **Color Code** fields may be configured for Auto



Figure 1-61. Add Channel



Figure 1-62. Add PLMN

- For the **Add Channel** dialog, select the **Carrier** and the **Color Code** and click **OK**

NOTE

When starting from the Channels tab it is recommended to use **Transmit on weakest neighbor of the selected channel** (see Figure 1-52). This option lets the system choose the most appropriate channel, based on the network survey results from the last five minutes. Unselecting this option will tell the system to superimpose on the selected channels.

NOTE

When starting from the **Analyze Neighbors** view, there is no "Transmit on weakest neighbor " option, because the user will specify the appropriate choice.

- For the **Add PLMN** dialog, specify the **MCC** and the **NDC**
- To set preferences for the **Registration** mode, select the **Preferences** tab in the **Start Registration** dialog. For details on setting Registration preferences, refer to Paragraph 1-11.1

Step 6. Once the desired channels and preferences are set up, click the **Start** button in the **Start Registration** dialog to begin the Registration process.

Step 7. Selecting **Start** initiates the data gathering process. Once the data is analyzed and logged and before the transmission begins, the user is prompted, by default with the **Transmit Validation** dialog (see Figure 1-64, Figure 1-65 and Table 1-8). This gives the user a chance to confirm what the RayFish system is going to transmit.

- The VSWR alarm will be shown when the reflected power is less than 5dB of the forward power. Check that all cable and antenna connections are secure (see Figure 1-63)



Figure 1-63. VSWR Alarm

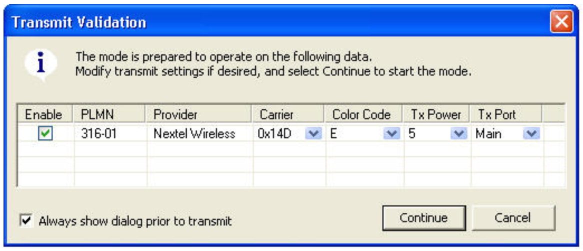


Figure 1-64. Transmit Validation Dialog (StingRay/KingFish)

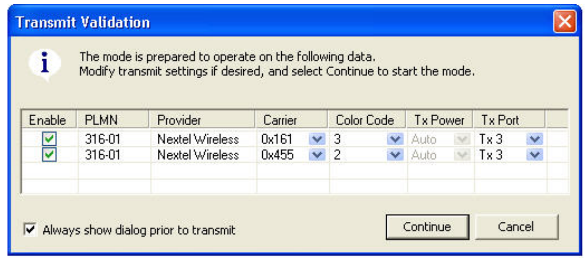


Figure 1-65. Transmit Validation (StingRay II)

Table 1-8. Transmit Validation Data Field Description

Column	Explanation
PLMN	Provider’s ID
Provider	The name of the provider associated with the PLMN
Carrier	Channel number
Color Code	Piece of information used to identify a tower
Tx Power	User can change this before transmission (Grayed out when automatic power balancing is enabled (Figure 1-65)
Tx Port	Allows the user to change **Main** or **Ext PA** (StingRay II will automatically specify the configured Tx Port)

NOTE

Transmission dialog can be disabled, see Paragraph 1-11.1.3.

NOTE

While registering, the transmit options buttons are shown on the toolbar for on-the-fly configuration of the Transmit Power and External PA (see Figure 1-66).



Figure 1-66. Registration Transmit Toolbar

- To configure the transmit power level, left click the **Tx Power** button and select the desired level from the drop down menu
- To enable or disable the External PA, click the External PA button (see Figure 1-67)



Figure 1-67. External PA Button

NOTE

StingRay II will not have an **External PA** button visible on the Registration Mode Toolbar.

Refer to Paragraph 1-11.3 for details on viewing and understanding the Registration results. To manually switch between the **Main** Rx port and the **DF** port, click the **Antenna Selection** button (see Figure 1-68 and Figure 1-69).



Figure 1-68. Rx Main Antenna



Figure 1-69. Rx DF Antenna

Step 8. To Stop the Registration operation, the **Stop** button 

located on the toolbar.

1-11.3 REGISTRATION RESULTS

- If information matches with a subscriber in the subscribers list, the subscriber tag will reflect the matched subscriber
- The subscriber tag may also be highlighted and accompanied by an alert sound, as setup by the user
- Results can be suspended to stop incoming results from scrolling off screen either by selecting the **Suspend Results** button or simply clicking anywhere on the results view. Select **Resume Results** to update with the incoming results (including those that were suspended)



Figure 1-70. Suspend Results



Figure 1-71. Resume Results

- Subscribers can be added by right-clicking a result, which includes identity information, with results suspended (see Paragraph 1-5.2)
- The data can be organized by adding or removing columns, moving columns within the display, and sorting columns by ascending or descending order
  - Right-click on the column headings to see what columns are available to add/remove
  - Left-click and drag to move columns within the display

- Left-click column headings to sort ascending/descending

- The results will remain in the results view under the **Registration** tab (even if the mode is stopped) until a new Registration operation is started or the view is closed normally

1-11.3.1 Results View

The Results view displays the real-time mobile station registrations (see Figure 1-72 and Table 1-9).

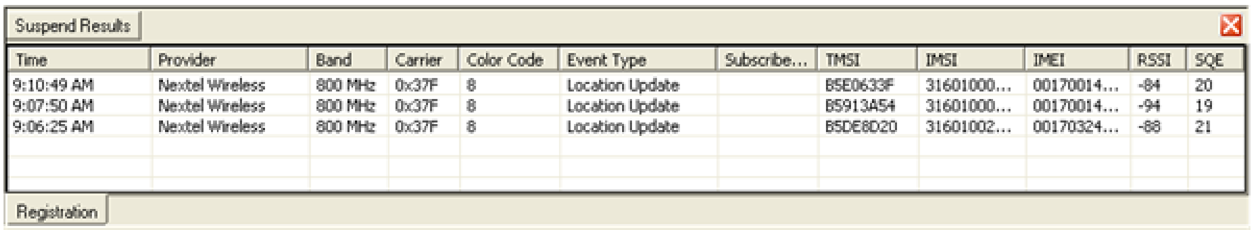


Figure 1-72. Registration Results View

Table 1-9. Registration Data Field Description

Column	Example	Explanation
Time	8:23:27 AM	Time the result was registered
Provider	Nextel Wireless	Name of the Service Provider
Band	800 MHz	Frequency range utilized for transmission
Carrier	0x433	Radio Frequency Carrier Number
Color Code	8	Base Station Identifier
Event Type	Location Update	A sequence of messages from a mobile that is identified as a certain event
Subscriber Tag	Green Boy	Name of Subscriber
TMSI	9E4FE1B9	Temporary Mobile Subscriber Identity. TMSI is MS-specific.
IMSI	316010...	International Mobile Subscriber Identity. TMSI is MS-specific.
IMEI	001700...	International Mobile Equipment Identity. IMEI is sim card specific.
RSSI	-63	Relative Signal Strength Indicator
SQE	8	Signal Quality Value

1-12 MOBILE STATION DIRECTION FINDING (MS DF)

The RayFish System transmits on a common weak channel for the selected Subscriber's Provider. Once a subscriber is connected, RSSI measurements are to be taken from the DF antenna to provide direction to the subscriber.

In the **MS DF** mode, the RayFish System commands the MS to raise its power output level to the highest setting at which the MS can transmit. The RayFish system will keep the MS engaged until the operator stops **MS DF**, or until interference/distance cause the signal to be lost.

1-12.1 MS DF PREFERENCES

Mobile Station Direction Finding (**MS DF**) preferences (see Figure 1-73) can be set up prior to, or at anytime during execution. It is important to note that **MS DF** preferences configured during operation will not take effect immediately, but instead when the **MS DF** process is restarted. The user can configure the **Transmit options**, **Direction finding options**, **Audible RSSI options**, and **Paging Only** option. All preferences will be remembered during subsequent launches of the iDEN Transceiver.

The **Paging Only** option is used to limit the number of mobile registrations when running an **MS DF**. This should be used in dense areas where a large number of mobile registrations can occur. When using this option, the RayFish system will page only the subscriber mobile, using the same LAI as the network.

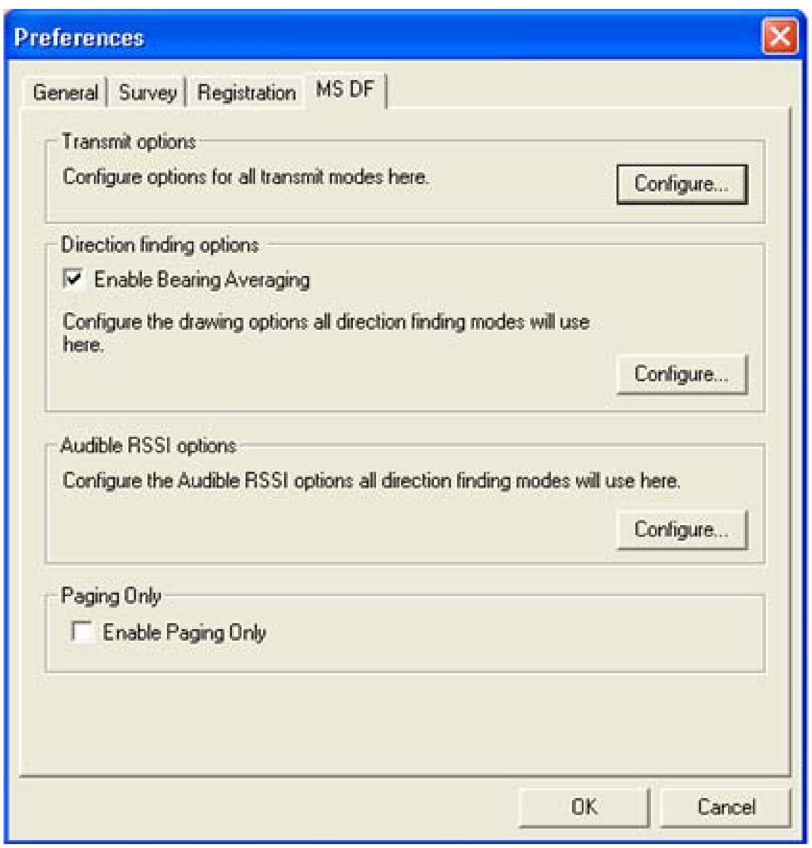


Figure 1-73. MS DF Preferences

1-12.1.1 Transmit options

Step 1. Select the **Configure** button to access the **Transmit Options** dialog (see Figure 1-74 and Figure 1-75).

- StingRay II provides the selection to **Enable automatic power balancing**
- Automatic power balancing is used during a multiple transmit mode
- Depending on the number of active transmissions, the controller will set the SDRs to a specific transmit power to achieve optimal performance
- This can be overridden during a mode or can be unchecked from the active transmission preferences before starting a mode. However, this is not recommended

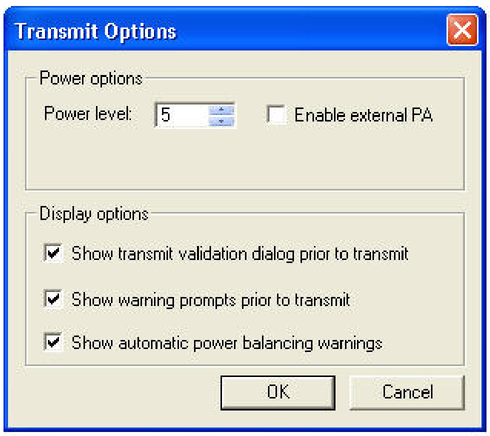


Figure 1-74. Transmit Options Dialog (StingRay/KingFish)

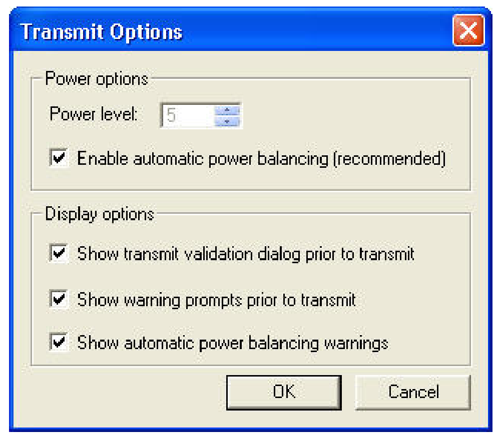


Figure 1-75. Transmit Options (StingRay II)

Step 2. Select desired **Power options** and **Display options**.

Step 3. Select **OK** to accept the changes and close the **Transmit Options** dialog.

1-12.1.2 Direction Finding Options

The user has the option to enable/disable bearing averaging. Bearing averaging will take the average of a preset number of bearings to create the final bearing measurement. If this option is disabled, then each bearing measurement will be displayed and the bearings may seem sporadic.

The user selects **Configure** (see Figure 1-76) to access the **Direction Finding Options** dialog.

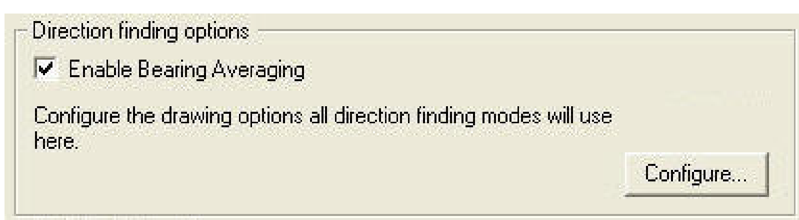


Figure 1-76. Direction Finding Options

The **Direction Finding Options** dialog (see Figure 1-77) provides the following:

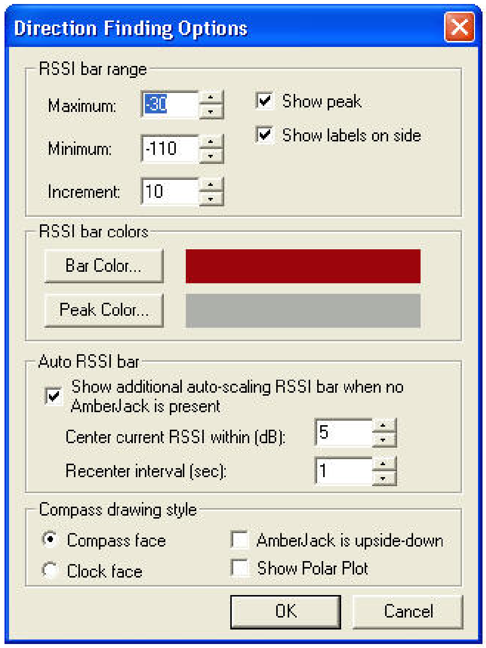


Figure 1-77. Direction Finding Options Dialog

The **RSSI bar range** area on the **Direction Finding Options** dialog (see Figure 1-77) provides the following options:

- **Maximum** – Set the maximum value from the range of -150 dB to 40 dB for the RSSI bar display
- **Minimum** – Set the minimum value from the range of -150 dB to 40 dB for the RSSI bar display
- **Increment** – Set the increment at which tick marks will be displayed
- **Show peak** – Select checkbox to show the peak RSSI received
- **Show labels on side** – Select checkbox to enable the RSSI bar to draw its labels next to the power display

The **RSSI bar colors** area on the **Direction Finding Options** dialog (see Figure 1-77) provides the following:

- The color of the RSSI bar can be specified by clicking the **Bar Color** button from the **RSSI bar colors** area and selecting a color (see Figure 1-79)
- The color of the RSSI bar can be specified by clicking the **Bar Color** button from the **RSSI bar colors** area and selecting a color (see Figure 1-79)



Figure 1-78. Color Selection For RSSI Bar



Figure 1-79. RSSI Bar

The **RSSI bar** area (see Figure 1-79) on the **Direction Finding Options** window provides the following options:

- **Show additional auto-scaling RSSI bar when no AmberJack is present –** Select checkbox to enable
- **Center Current RSSI within (dB)** – Selectable number with 5 the default
- **Recenter interval (sec)** – Selectable number with 1 the default

The **Compass drawing style** area (see Figure 1-80) on the **Direction Finding Options** window provides the following:



Figure 1-80. Compass Drawing Style

- **Compass face** – Radio button enables tick marks to represent compass degrees (see Figure 1-81)
- **Clock face** – Radio button enables tick marks to represent clock markings (see Figure 1-81)
- **AmberJack is upside-down** – Enable checkbox only if the AmberJack is mounted in an upside-down configuration
- **Show Polar Plot** – Enable checkbox to display a graphical representation of the RSSI strength measured across the 360° (Polar Coordinates) (see Figure 1-82)

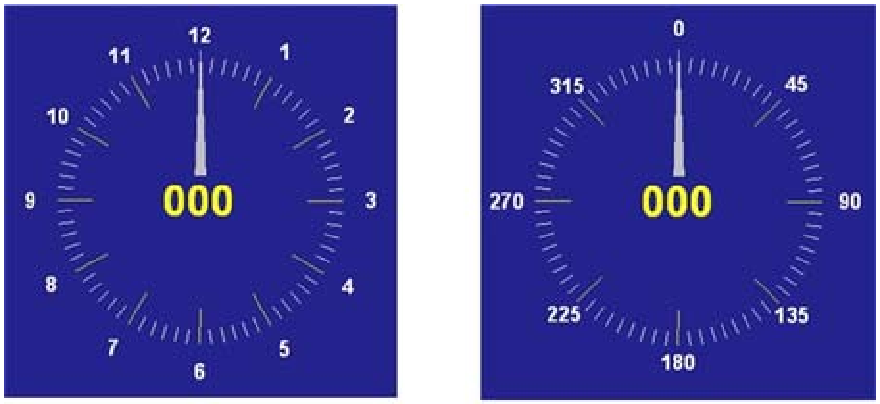


Figure 1-81. Clock vs. Compass



Figure 1-82. Compass Active Using Polar Plot

1-12.1.3 Audible RSSI Options

The user has the option to enable/disable sound options by selecting **Configure** in the **Audible RSSI options** section as shown in Figure 1-73. The **Configure DF Audible RSSI** dialog opens as shown in Figure 1-83. When the sound options are selected as desired, click **OK** to accept changes and return to the **MS DF** tab.



Figure 1-83. Configure DF Audible RSSI

1-12.2 MS DF OPERATION

The MS DF mode begins as a Registration by attempting to log registrations from iDEN **Mobile Stations** (MS) that are within range of the RayFish system. During this process the RayFish will register the MS to obtain specific IMSI, TMSI, and IMEI information from each MS.

When an MS' information is received matching the desired subscriber, the mode will change to a Transmit MS DF mode. During this time the system will (if applicable) shut down all remaining transmitters except the transmitter that has connected to the MS and continue to page the subscriber. The RayFish system will then monitor RSSI levels and with the aid of an Amberjack, determine a bearing in the direction of the MS.

The following procedure describes how to operate the MS DF mode:

Step 1. Select from 1 to 10 desired subscribers in the subscribers view (use Ctrl + Click to select multiple subscribers).

NOTE

> The user also has the ability to start an MS DF from the **Channels** tab, **Providers** tab, and **Neighbor Analysis View** results.

Step 2. Click the **MS DF** button (

) on the iDEN Transceiver toolbar. The **Start MS DF** dialog will open (see Figure 1-84). The subscriber selected in the subscribers view, as well as their identity information are listed under the **Subscribers** tab. The **Preferences** tab was discussed earlier (see Figure 1-73).

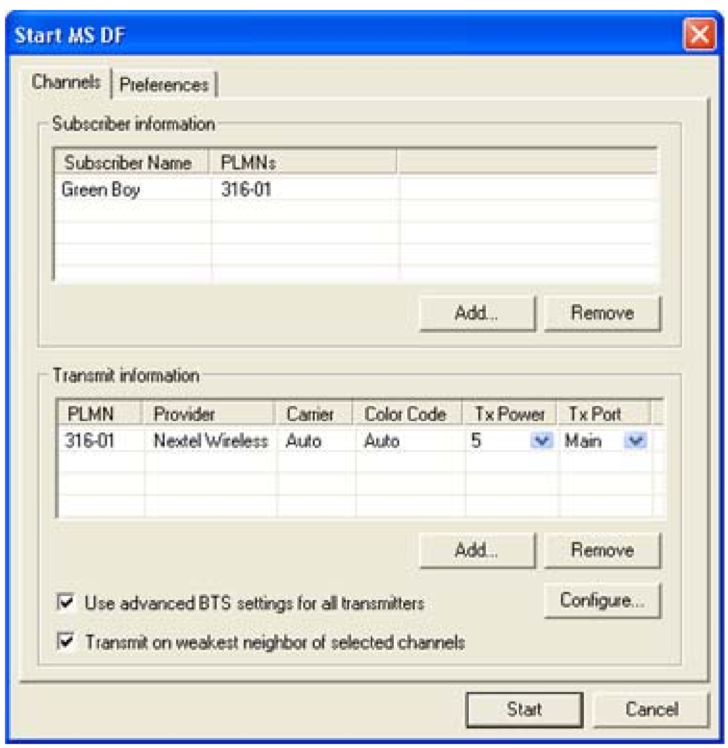


Figure 1-84. Start MS DF Dialog

NOTE

If this mode was started from a tab other then the **Subscribers** tab, the user can click **Add.**.. under the **Subscriber Information** section of the **Start MS DF** dialog and manually add up to 10 subscribers.

Step 3. To remove a subscriber, select the row and click the **Remove** button (use the Ctrl + Click to select multiple subscribers).

- Transmit information contains dropdown boxes for PLMN, Provider, Carrier, Color Code, Tx Power, and Tx Port
- When the checkbox for **Use advanced BTS settings for all transmitters is selected**, the **Configure** button becomes available

NOTE

The "**Transmit on weakest neighbor of selected channels**" is only available if mode is started from the **Channels** tab. (Not recommended to disable)

Step 4. Select the **Configure** button to open the Advanced BTS parameters dialog.

Step 5. **Advanced BTS Parameters** dialog (see Figure 1-85). Use these parameters (see Table 1-10) to emulate a base station. All fields are required. Select the **Help** button for detailed explanations of each field.

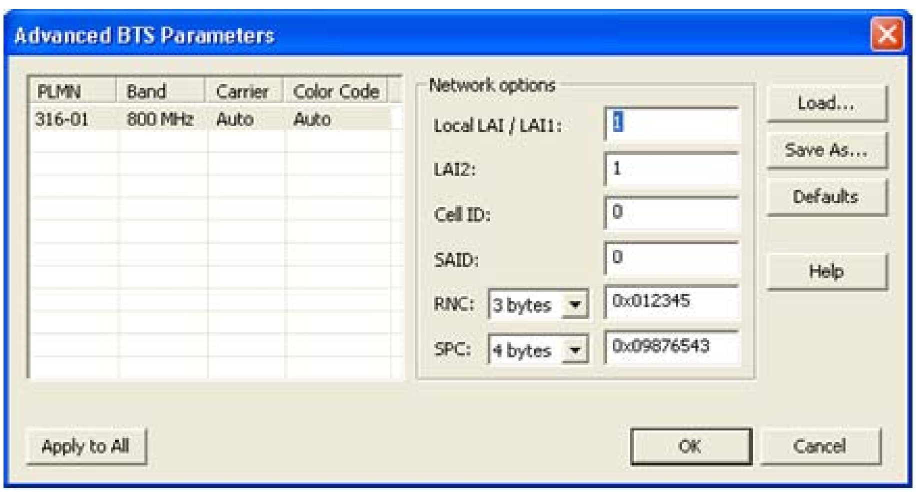


Figure 1-85. Advanced BTS Parameters Dialog

Table 1-10. Advanced BTS Parameters Description

Field/Button	Explanation
PLMN	Public Land Mobile Network (Combination of Mobile Country Code (MCC) and Nationwide Direct Connect (NDC) codes
Band	Frequency range used for transmission
Carrier	Channel/carrier number, listed in hex format

Table 1-10. Advanced BTS Parameters Description (Continued)

Field/Button	Explanation
Color Code	An identification affiliated with each channel, making each channel unique. Neighboring base stations will have different color code pairs assigned to their channels.
Local LAI/LAI1	Local Area Identifier/Local Area Identity 1. The **LAI1** is equal to the **Local LAI** and identifies a set of Base Stations within a geographical area. This number can range from 1 to 65534.
LAI2	Local Area Identifier/Local Area Identity 2. The **LAI2** also identifies a set of Base Stations within a geographical area. This number can range from 1 to 65534.
Cell ID	The **Cell ID** identifies a Base Station within a local area. This number can range from 0 to 65535.
SAID	Service Area Identifier. The **SAID** identifies a set of one or more Location Areas. This number can range from 0 to 255.
RNC	Regional Network Code. This number can range from 0 to (8 * 2^32-1). Specify the **RNC** in hex. It must start with **0x**.
SPC	Service Provider Code. This number can range from 0 to (8 * 2^32-1). Specify the **SPC** in hex. It must start with **0x**.
Load	Loads BTS parameters from a file (if available)
Save As	Saves selected BTS parameters (*.abc.iden filename extension)
Defaults	Loads default BTS parameters (NOTE: This function will overwrite BTW parameters for selected fields)
Help	Displays an online help menu that describes the following fields: LAI1, LAI2, Cell ID, SAID, RNC, and SPC
Apply to All	Apply options to all Carriers/channels in the list
OK	Accepts changes and closes the window
Cancel	Closes the window without accepting changes

Step 6. Edit the fields and select **OK** to return to the **Start MS DF** window.

Step 7. Once the desired subscribers and preferences have been set, click the **Start** button in the **Start MS DF** dialog.

- The iDEN Transceiver gathers operation information and when complete, if enabled, the user will be prompted with the **Transmit Validation** dialog (see Figure 1-86).

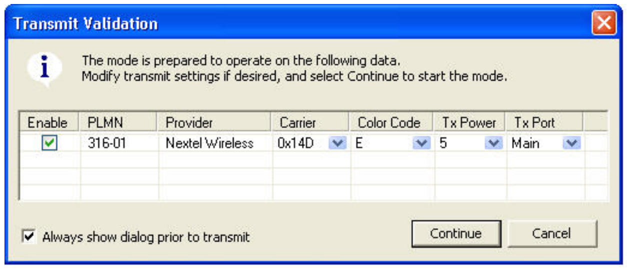


Figure 1-86. Transmit Validation

Step 8. When transmit selections are configured as desired, select **Continue** to proceed with the MS DF operation.

NOTE

> While transmitting, the transmit options buttons are shown on the toolbar for on-the-fly configuration of the **Transmit Power** and **External PA** (see Figure 1-87).

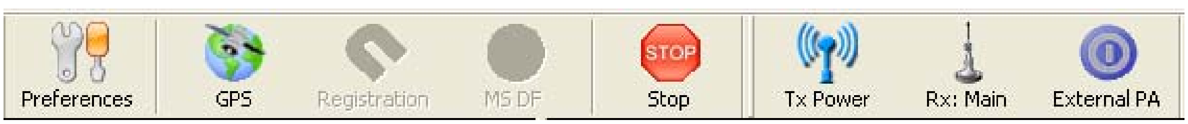


Figure 1-87. MS DF Transmit Toolbar With Main Antenna

- To configure the transmit power level, left click the **Tx Power** button and select the desired level from the drop down menu (see Figure 1-88 and Figure 1-89)

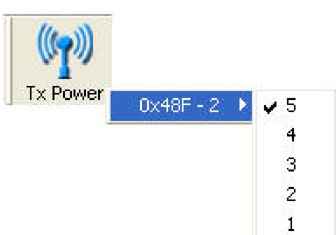


Figure 1-88. Tx Power Button Menu (StingRay/KingFish)

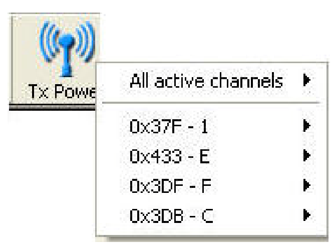


Figure 1-89. Tx Power Button Menu (StingRay II)

- To enable or disable the External PA, click the **External PA** button (see Figure 1-90)



Figure 1-90. External PA Button

Step 9. To stop the MS DF operation, select the **Stop** button 

located on the toolbar.

1-12.3 MS DF OPERATION RESULTS

- If information matches with a subscriber in the subscribers list, the subscriber tag will reflect the matched subscriber
- The subscriber tag may also be highlighted and accompanied by an alert sound, as setup by the user
- Results can be suspended to stop incoming results from scrolling off screen either by selecting the **Suspend Results** button or simply clicking anywhere on the results view. Select **Resume Results** to update with the incoming results (including those that were suspended)
- Subscribers can be added by right-clicking a result, which includes identity information, with results suspended
- The data can be organized by adding or removing columns, moving columns within the display, and sorting columns by ascending or descending order
- The results will remain in the results view under the **MS DF** tab (even if the mode is stopped) until a new operation is started or the view is closed normally

1-12.3.1 Event Summary View

The **Event Summary** view displays the real-time mobile station registrations (see Figure 1-91 and Table 1-11).

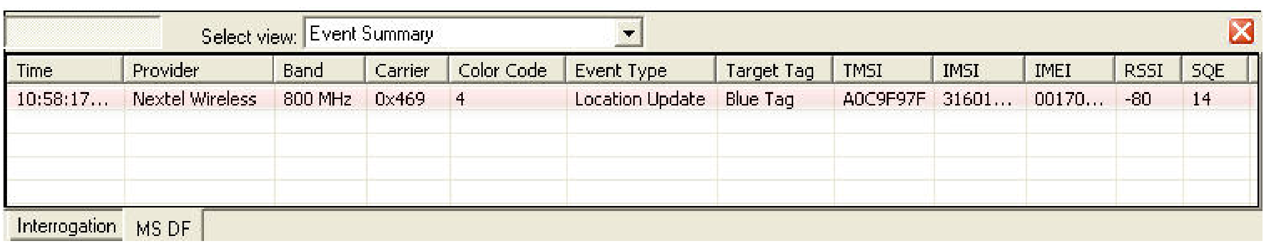


Figure 1-91. MS DF Event Summary Results

Table 1-11. MS DF Event Summary Data Columns

Column	Example	Explanation
Time	10:58:17 AM	Date and time the result was surveyed
Provider	Nextel Wireless	Name of the Service Provider
Band	800 MHz	Frequency range utilized for transmission
Carrier	0x469	Radio Frequency Carrier Number
Color Code	4	Base Station Identity

Table 1-11. MS DF Event Summary Data Columns (Continued)

Column	Example	Explanation
Event type	Location Update	A sequence of messages from a mobile identified as a certain event
Subscriber Tag	Blue Tag	Name of Subscriber
TMSI	A0C9F97F	Temporary Mobile Subscriber Identity
IMSI	31601...	International Mobile Subscriber Identity
IMEI	00170...	International Mobile Equipment Identity
RSSI	-80	Received Signal Strength Indicator of the forward link in dBm
SQE	14	Signal Quality Value

1-12.3.2 Subscribers Status View

The **Subscriber Status** view, as shown in a sample results view in Figure 1-92 and Table 1-12, displays the real-time mobile activity, including the RSSI strength. The **Engaged Mobile** pane displays identification information and a user defined name. The Subscriber Status view (see Figure 1-93) reports the direction and range to the subscriber mobile.

NOTE

StingRay II accepts and will search on multiple subscribers, but locks onto the first one it finds.

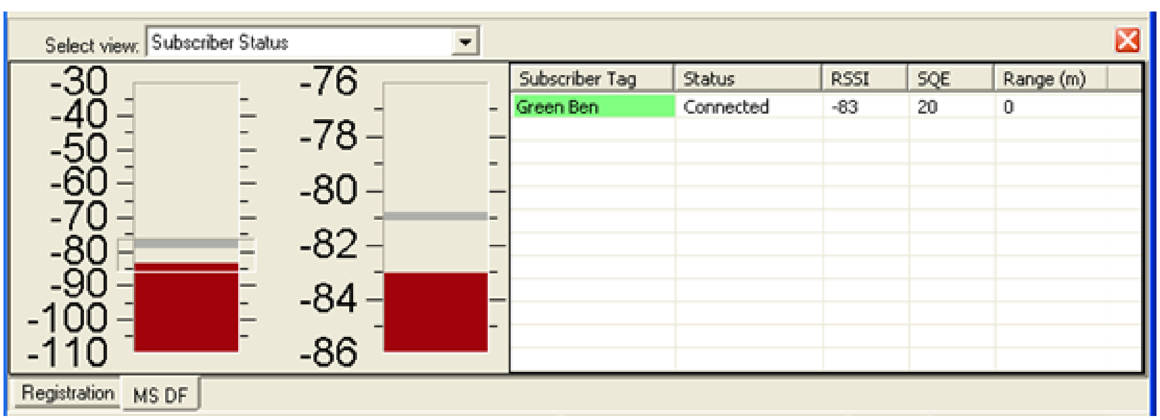


Figure 1-92. MS DF Subscriber Status

Table 1-12. MS DF Subscriber Status Results Data Columns

Column	Example	Explanation
Subscriber Tag	Green Boy	Name of subscriber
Status	Connected	Indicates current subscriber status

Table 1-12. MS DF Subscriber Status Results Data Columns (Continued)

Column	Example	Explanation
RSSI	-82	Relative Signal Strength Indicator
SQE	20	Signal Quality Value
Range (m)	350	Estimated distance to the subscriber (in meters)

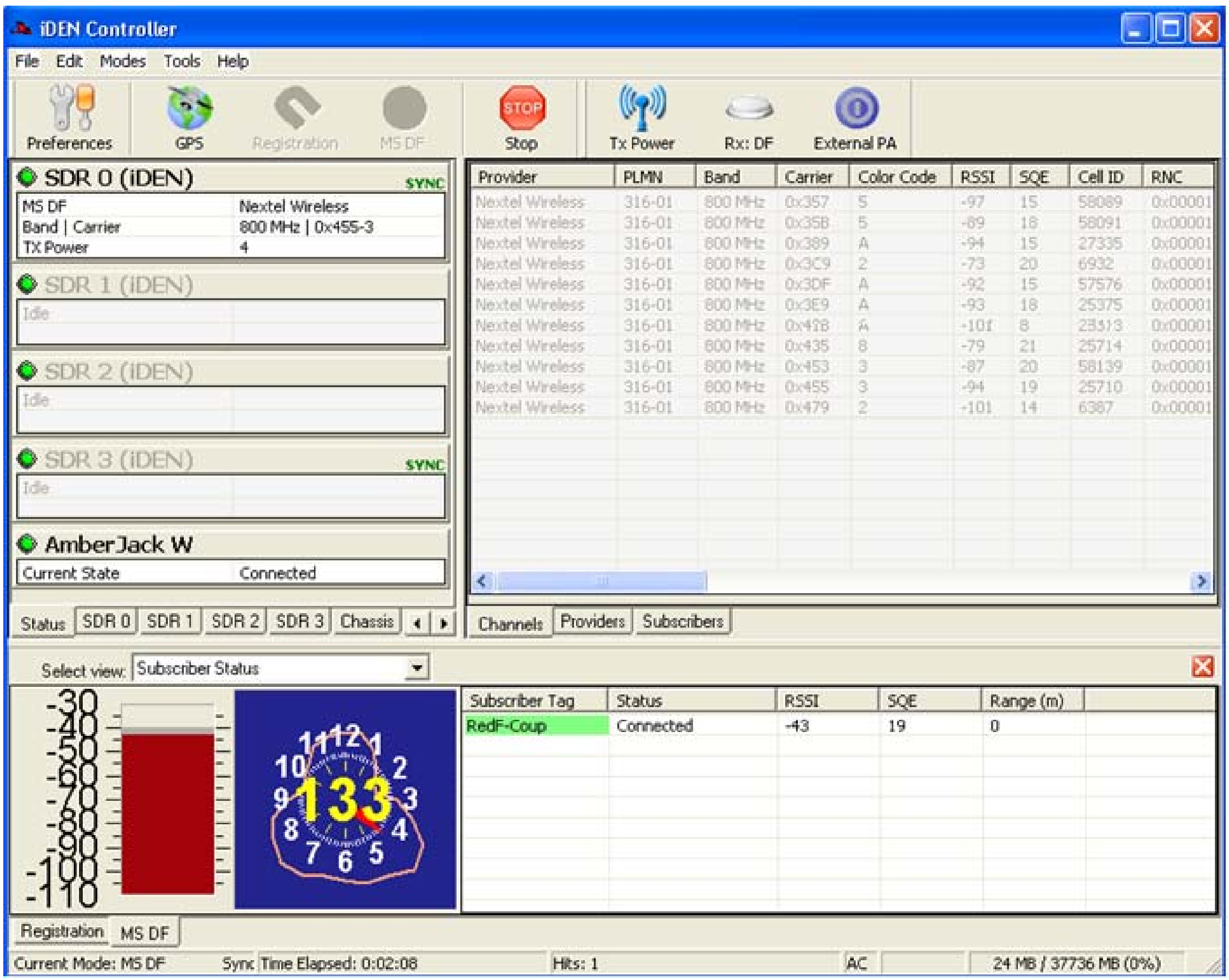


Figure 1-93. MS DF Subscriber Status With AmberJack

1-13 HELP

The iDEN Controller Help menu provides the user with quick access to system information via the About window's Details screen.

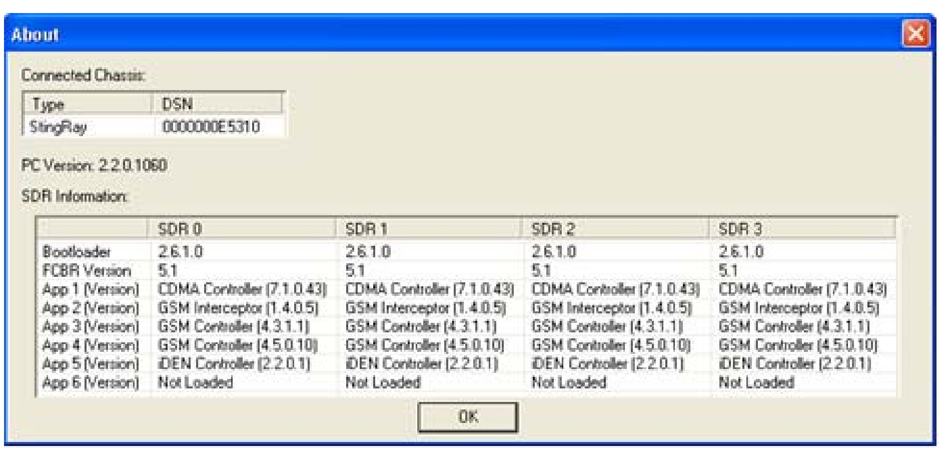
To view **About** window, select **About** from the **Help** menu (see Figure 1-94). The **About** window will open (see Figure 1-95). Select the **Details...** button to display the system details screen (see Figure 1-96). This information will be useful whenever a user places a service call. The **About** details dialog contains the current PC Version number. The SDR Information area contains the protocol firmware and corresponding version that are loaded on each SDR.



Figure 1-94. Help Menu



Figure 1-95. About Dialog



Type	DSN
StingRay	0000000E5310

	SDR 0	SDR 1	SDR 2	SDR 3
Bootloader	2.6.1.0	2.6.1.0	2.6.1.0	2.6.1.0
FCBR Version	5.1	5.1	5.1	5.1
App 1 (Version)	CDMA Controller (7.1.0.43)	CDMA Controller (7.1.0.43)	CDMA Controller (7.1.0.43)	CDMA Controller (7.1.0.43)
App 2 (Version)	GSM Interceptor (1.4.0.5)	GSM Interceptor (1.4.0.5)	GSM Interceptor (1.4.0.5)	GSM Interceptor (1.4.0.5)
App 3 (Version)	GSM Controller (4.3.1.1)	GSM Controller (4.3.1.1)	GSM Controller (4.3.1.1)	GSM Controller (4.3.1.1)
App 4 (Version)	GSM Controller (4.5.0.10)	GSM Controller (4.5.0.10)	GSM Controller (4.5.0.10)	GSM Controller (4.5.0.10)
App 5 (Version)	iDEN Controller (2.2.0.1)	iDEN Controller (2.2.0.1)	iDEN Controller (2.2.0.1)	iDEN Controller (2.2.0.1)
App 6 (Version)	Not Loaded	Not Loaded	Not Loaded	Not Loaded

Figure 1-96. About Screen Details (StingRay I)

Chapter

2 TOOLS

2-1 WHAT THIS CHAPTER CONTAINS

This chapter contains tools available to the iDEN Transceiver user.

- **Database Viewer** (see Paragraph 2-2) **-** The **Database Viewer** allows the viewing of stored data
- **Map Router** (see Paragraph 2-3) **-** The **Map Router** provides the interface between the **iDEN Transceiver** and **MapPoint**
- **Perform Self-Test** (see Paragraph 2-11) **-** This tool commands the SDRs to initialize and confirms accurate hardware functionality
- **Advanced BTS Editor** (see Paragraph 2-12) **-** The iDEN Transceiver
- **Night Mode Display Options** (see Paragraph 2-13) **-** The iDEN Transceiver installs two Windows display themes (**Gray Night Theme** and **Green Night Theme**) to support reduced light emissions from the user interface display
- **Analyze Neighbors Feature** (see Paragraph 2-14) **-** This feature identifies transmit channels within the area of interest for Registration and MS DF operations

2-2 DATABASE VIEWER

The iDEN Transceiver provides the user with the Database Viewer tool for viewing stored data. The user can either launch the Database Viewer from the Windows **Start** menu (**Start**>**Programs**>**iDEN Transceiver** >**Database Viewer**) from the PC desktop or through the **Tools** menu within the iDEN Transceiver. The **Database Viewer** will open as a second application window (see Figure 2-1). Opening the **Database Viewer** from the iDEN Transceiver will open the current database.

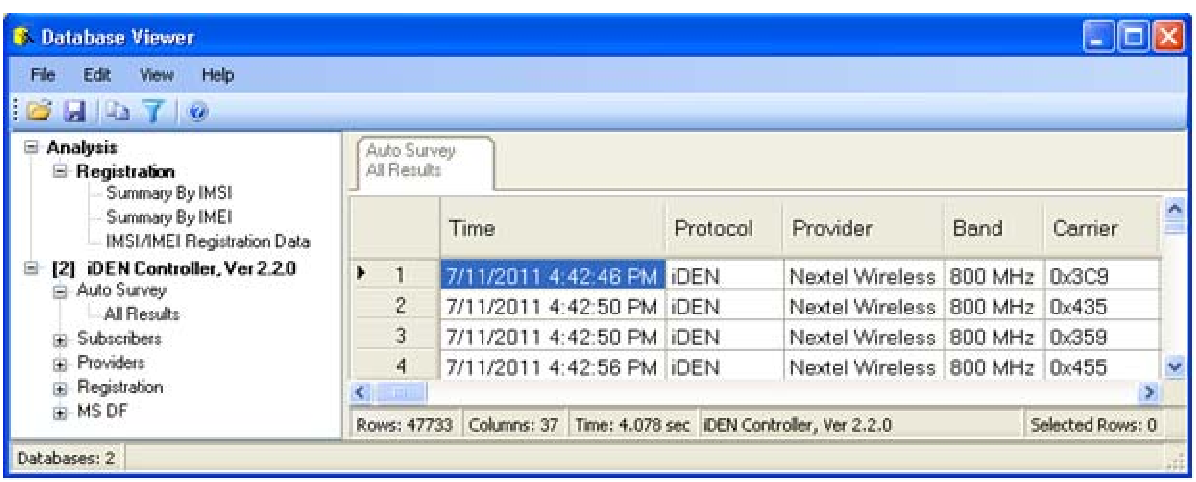


Figure 2-1. Database Viewer Main Window

Data may be displayed by Session Tag in the Data Results view in the Database Viewer as shown in Figure 2-2.

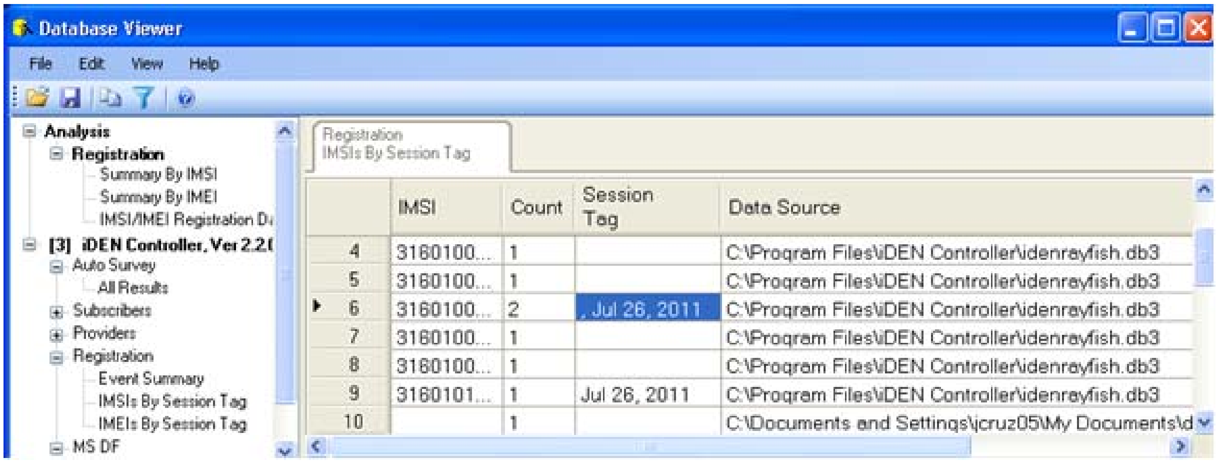


Figure 2-2. Data by Session Tag View

2-2.1 OPEN DATABASE

The following procedure describes how to open a saved database.

Step 1. Select **Open Database** from the **File** menu (see Figure 2-3) or click the **Open** icon on the toolbar (see Figure 2-4).

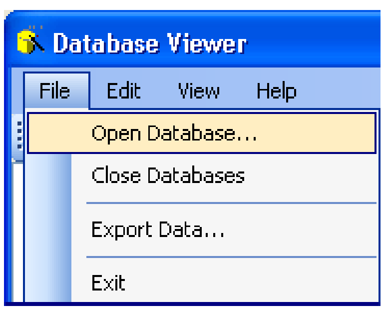


Figure 2-3. File > Open Database



Figure 2-4. Open Icon

Step 2. From the **Open** dialog (see Figure 2-5), select the desired database file to load and click the **Open** button. The database will load in the **Database Viewer** (see Figure 2-1).

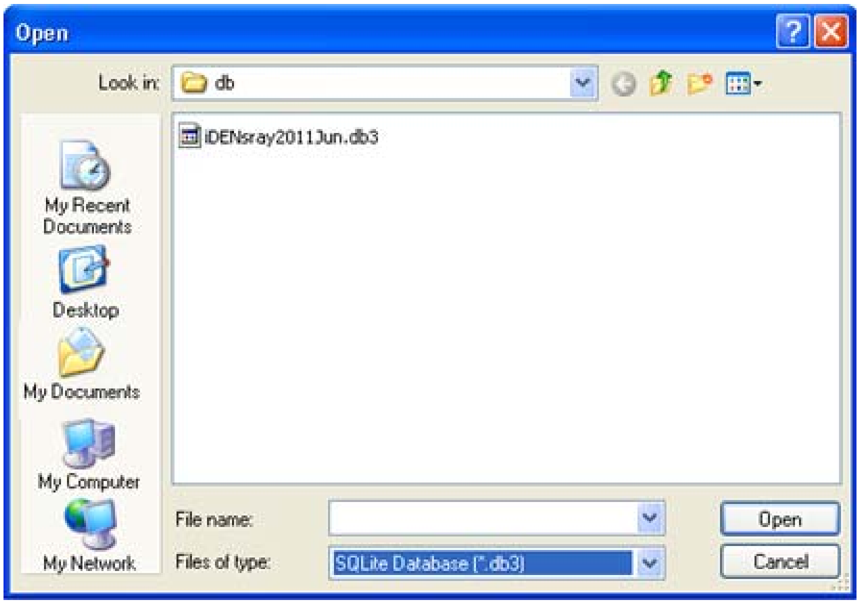


Figure 2-5. Open Database

2-2.2 CLOSE DATABASE

The following procedure describes how to close a database.

Step 1. With a database opened in the **Database Viewer**, select the **File** menu.

Step 2. Select **Close Database** (see Figure 2-6).

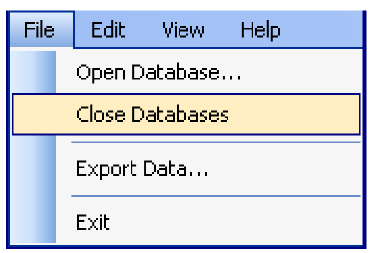


Figure 2-6. File > Close Database

2-2.3 EXPORT DATA

The following procedure describes how to export data. By default, the Export Data exports the entire table view to the chosen data file.

Step 1. Select one or more rows from the **Database Viewer** (see Figure 2-7) to export a portion of the table.

NOTE

Press **Shift**+left mouse click to select sequential rows in the Database Viewer.
Press **Ctrl**+left mouse click to select non-sequential rows in the Database Viewer ().
Press Ctrl+A to select all rows in the Database Viewer.

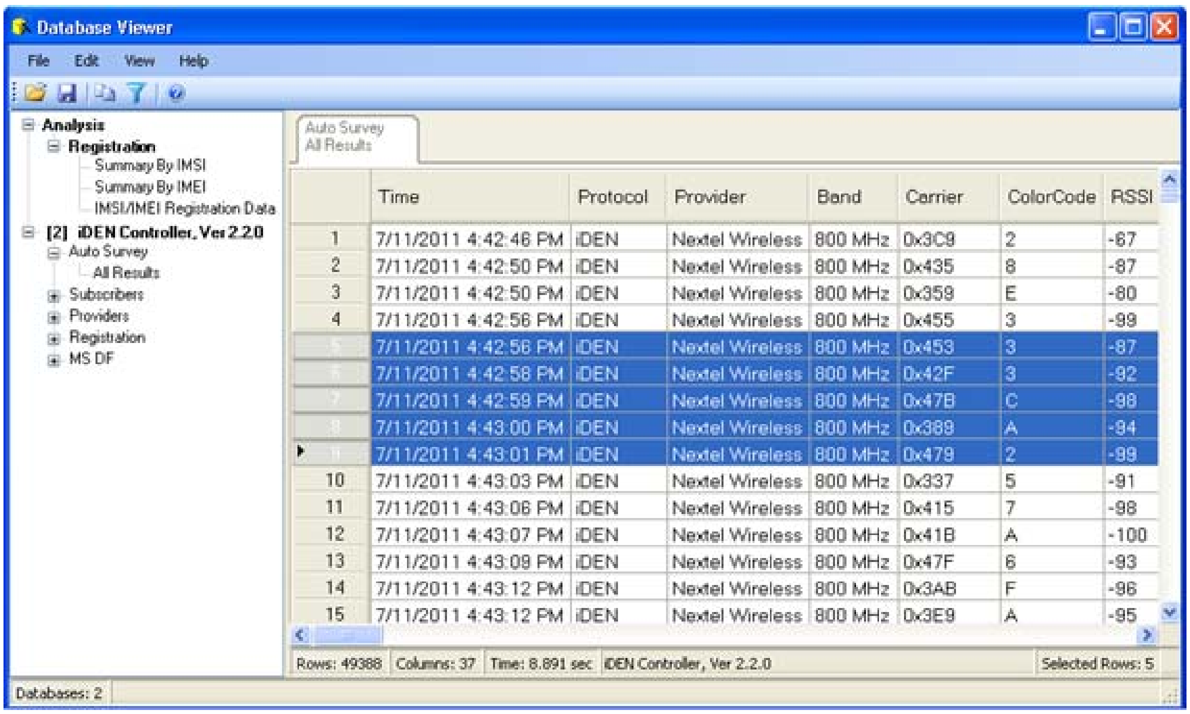


Figure 2-7. Multiple Rows Selected

Step 2. Select the **File** menu and **Export Data** (see Figure 2-8) or the **Export** icon from the toolbar (see Figure 2-9).

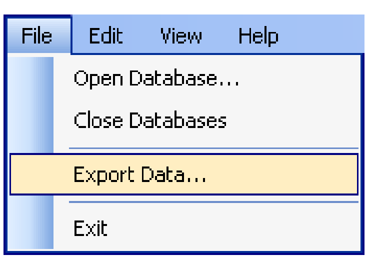


Figure 2-8. File > Export Data



Figure 2-9. Export Icon

- The Export Data dialog will open (see Figure 2-10)

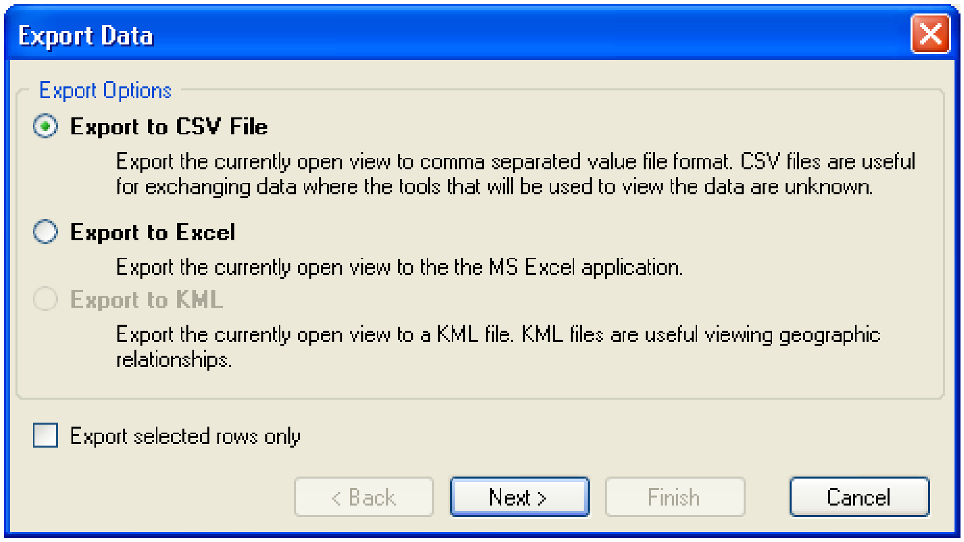


Figure 2-10. Export Data Options

The Export Options area contains the three options for the export file type.

- **Export to CSV File** – Exports the currently open view (table) to a comma separated value file format. The CSV files are useful for exchanging data where the tools that will be used to view the data are unknown
- **Export to Excel** – Exports the currently open view to the MS Excel application and opens the file in MS Excel. This feature is only supported if MS Excel is already installed on the computer. Excel will open automatically to allow viewing of the data
- **Export to KML** – Exports the currently open view to a KML file. KML files are useful for viewing geographic relationships. This option is grayed out unless the view contains Latitude and Longitude fields

Step 3. Click the radio button in front of the file type you want to create.

Step 4. Select the checkbox to Export selected rows only.

Step 5. Click **Next** button.

The Export Data window opens to choose the location to save the file. Since the CSV file choice was made in the example, the CSV Export Options dialog appears (see Figure 2-11). The two checkbox selections are described below:

- **Include application and view information** – This adds a line with the database type and version number to the beginning of the CSV file
- **Include header row** – This adds a header row at the beginning of the CSV file

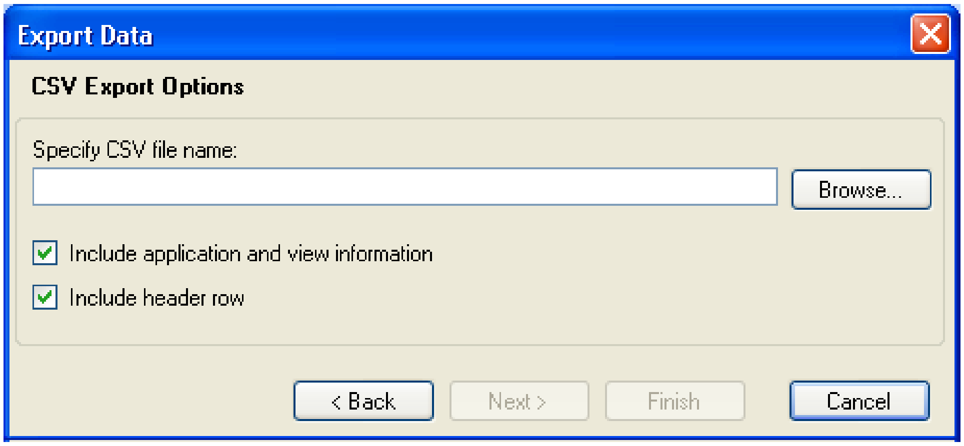


Figure 2-11. Export Data Options 2

Step 6. Select the **BROWSE** button (see Figure 2-11) to open the **Save As** dialog (see Figure 2-12).

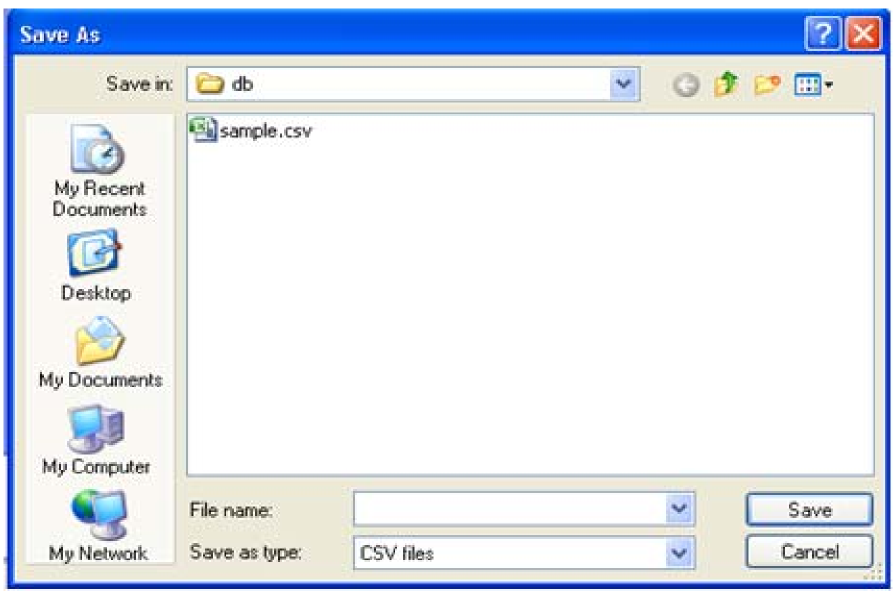


Figure 2-12. Save as Dialog

Step 7. Navigate to the location to save the exported file.

Step 8. Type the filename desired and click **Save**.

Step 9. Click the **Finish** button to complete exporting the data.

2-2.4 VIEW DATA

Data logged and stored by the iDEN Transceiver can be loaded and viewed in the Database Viewer. The Database Viewer organizes the data in the Data Views pane by operational mode.

2-2.4.1 Data Views

The **Data Views** pane organizes the data by operational mode (see Figure 2-13). To view data, select the **All Results** under the desired mode.

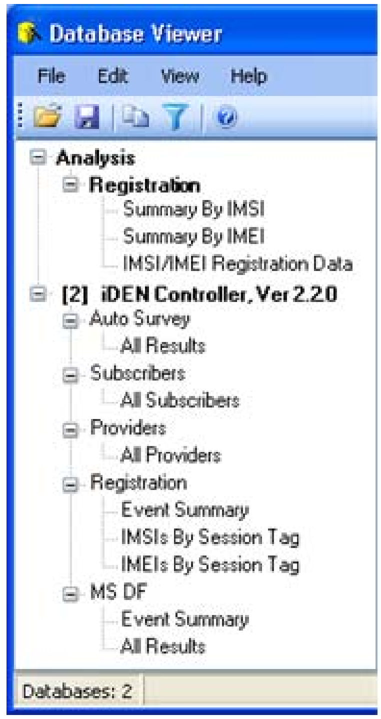


Figure 2-13. Data Views Pane

2-2.4.2 Filters

The **Database Viewer** allows and recommends that the user configure filters on large sets of data. The **Configure Filters** dialog (see Figure 2-14) will open automatically when a large set of data has been selected for viewing. The dialog can also be opened using the **Filter** icon on the toolbar (see Figure 2-15).

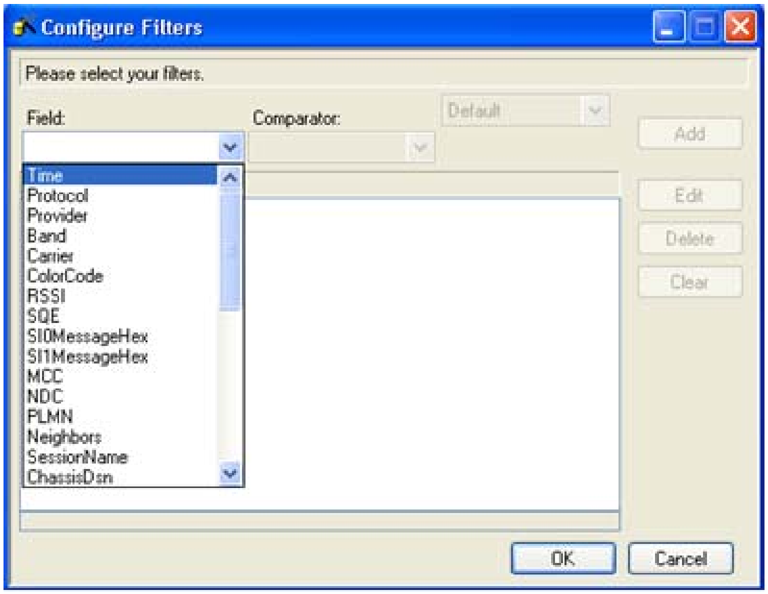


Figure 2-14. Configure Filters – Field Selection



Figure 2-15. Filter Icon

The following procedure describes how to filter data.

Step 1. If the **Configure Filters** window doesn't open automatically, select the desired results to be filtered within the **Data Views** panel and then click the **Filter** icon (see Figure 2-15).

Step 2. Select the **Field** drop down (see Figure 2-14) to specify the field on which to filter.

Step 3. Select the **Comparator** drop down (see Figure 2-16) to specify the comparison to apply to the selected Field option.

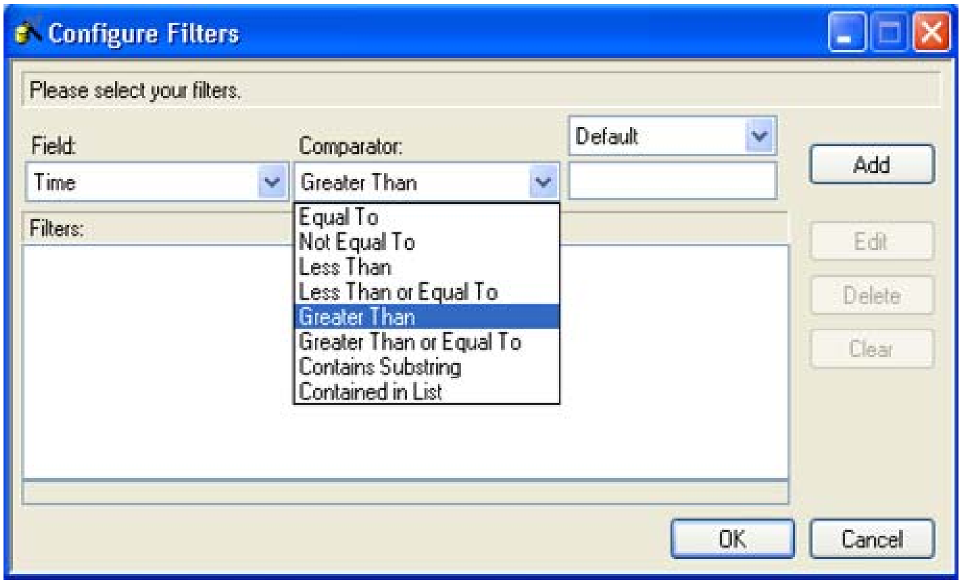


Figure 2-16. Configure Filters – Comparator Selection

Step 4. Select the method to enter the item being compared against (see Figure 2-16).

- The **Default** option will set the method for entering the item being compared against with the default control in relation to the **Field** option selected. For example, if the **Field** option selected is *Provider*, the **Default** option will allow the user to enter a text string
- The **Text–only** option will override the default method for the chosen **Field** and only allow the user to enter a text string
- The **Match Field** option will allow the user to pick another **Field** to compare against the first **Field** chosen using the **Comparator**

Step 5. Click the **Add** button to add the filter to the **Filters:** area (see Figure 2-17).



Figure 2-17. Configure Filters – Add Button

- Repeat steps 2 through 5 to add multiple filters. For example, one may wish to view Auto Survey data logged on a certain date and for a certain provider, but only with an average RSSI greater than -100 (see Figure 2-18)

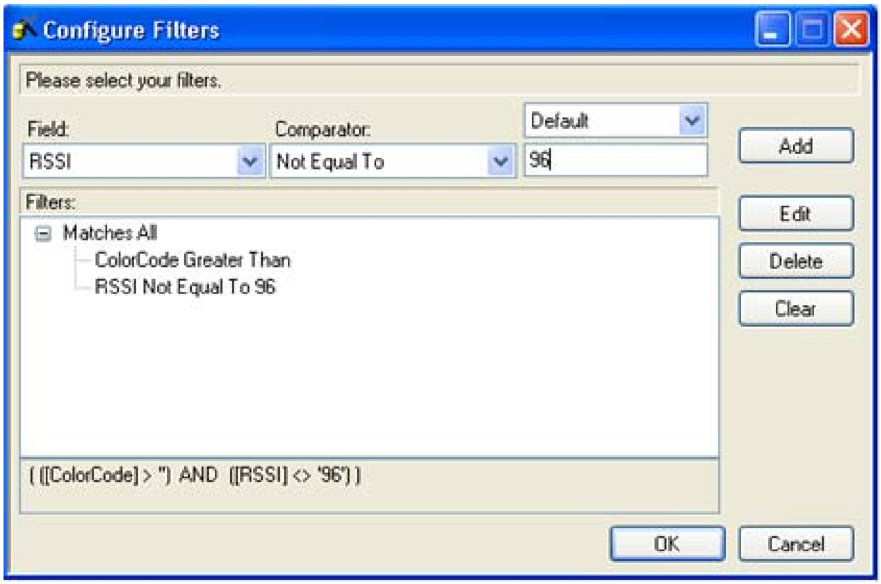


Figure 2-18. Configure Filters Window Configuring Multiple Filters

Step 6. Once the desired filters have been added to the **Filters:** area, the user can configure them as desired:

- Select a filter from the **Filters:** area and click the **Edit** button to re-populate the drop down controls with the chosen filter. The user can edit the filter and click **Save** to update or click **Cancel** to leave the filter unchanged

- Select a filter from the **Filters:** area and click the **Delete** button to remove that filter from the **Configure Filters** window

- The **Clear** button removes all defined filters from the **Configure Filters** window

Step 7. Right-click on a filter and select **Create Group** to create a new group with the chosen filter (see Figure 2-19).

- By right clicking on a group, the user can toggle the entire group between **Match All** and **Match Any**. **Match All** will only display results which match all the filters in the group. **Match Any** will show all results that match any of the filters in the group

- **Toggle** negation toggles the **Comparator** portion of the filter to the exact opposite. For example, if **Toggle negation** is chosen on a Filter with the **Comparator** "Equal To" it will be toggled to "Not Equal To"

- The **Edit** and **Delete** options in the right-click menu perform the same function as the **Edit** and **Delete** buttons on the **Configure Filters** window

- Filters can be dragged and dropped into other groups. Select and hold a filter and move it over the desired group in the **Filters:** area

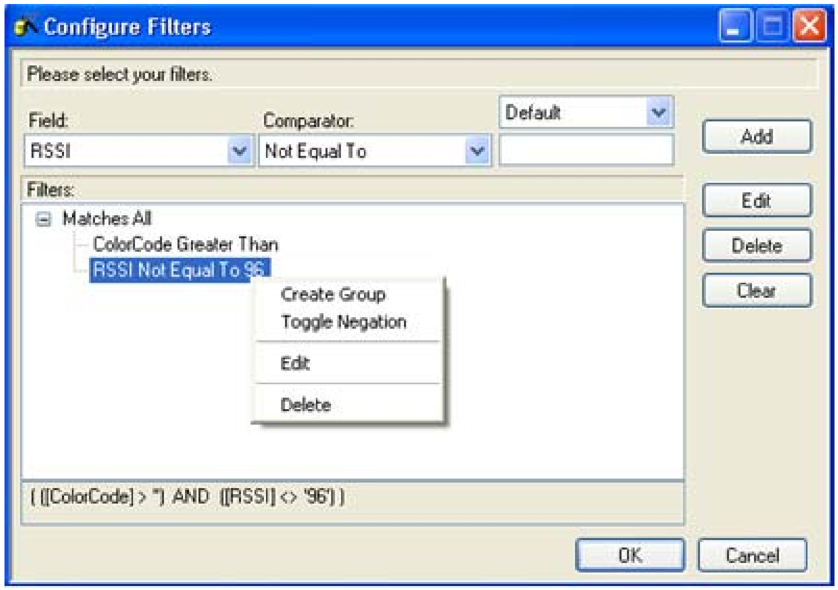


Figure 2-19. Configure Filters Window – Right-Click Menu

Step 8. Once the desired filters have been configured in the Configure Filters window select the **OK** button to apply the filter. Selecting the **Cancel** button will exit the Configure Filters window without applying filters and all available results will be displayed.

2-2.5 EDIT MENU

The Database **Edit** menu provides the user an alternate path to configure database properties from within the Database Viewer application (see Figure 2-20).

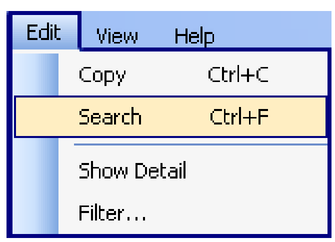


Figure 2-20. Edit Menu

- A **Search** option has been added to the Database Viewer **Edit** menu. When selected, it opens the Find bar at the bottom (see Figure 2-21)



Figure 2-21. Find Bar

- Enter the Search data in the **Find** field

- Select the **Next** arrow to locate the next occurrence of that data or the **Previous** arrow to scroll up and find the previous entry for the data
- Select the **Orange X** to close the Find Bar

2-2.6 ABOUT DATABASE VIEWER

The **About Database Viewer** dialog provides version information. To open the dialog, from the **Database Viewer** window, select the **Help** menu from the toolbar or the **Help** icon as shown in Figure 2-22.

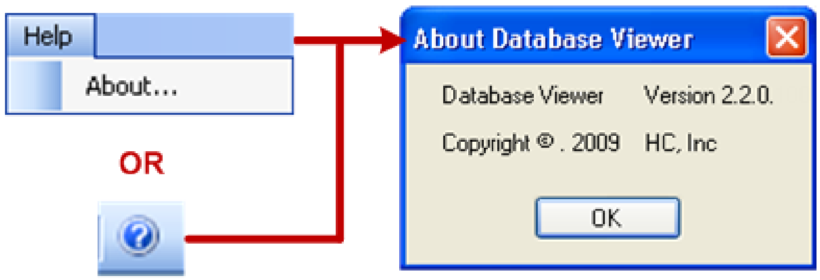


Figure 2-22. About Database Viewer

2-3 CONFIGURE MAP ROUTER

Map Router is an application that is installed in addition to the iDEN Controller. This chapter covers the following topics:

- Map Router Overview
- Connecting Map Router to iDEN
- Map Router Setup
- Map Router Main Functions
- Multiple Location Finding Estimate
- Geographic Filter
- Multi-Playback File Support

2-4 MAP ROUTER OVERVIEW

When the iDEN Controller is installed, it also installs Map Router and creates a Map Router icon on the Windows Desktop. Map Router is configured to run in the background when installation completes and when the PC is restarted. The Windows Task bar Notification area located in the lower right corner of the desktop will display Map Router icon when the application is running as shown in the Figure 2-23.

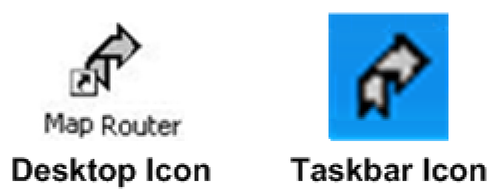


Figure 2-23. Map Router Icons

Map Router provides an interface between the iDEN application and **MapPoint**. When setting up Map Router to communicate with MapPoint, ensure that MapPoint is properly displaying the COM add in. Map Router now automatically configures the MapPoint COM add in.

2-5 CONNECTING MAP ROUTER TO IDEN

This section describes settings to configure the iDEN Controller's connections to Map Router tool. When the connection is activated, all data is passed to Map Router.

- To open Map Router Configuration window, select **Configure Map Router** from the Tools menu
- To configure Map Router to automatically connect on startup, select the **Connect to Map Router on startup** check box as shown in the Figure 2-24
- To manually initiate the connection, select the **Connect** button

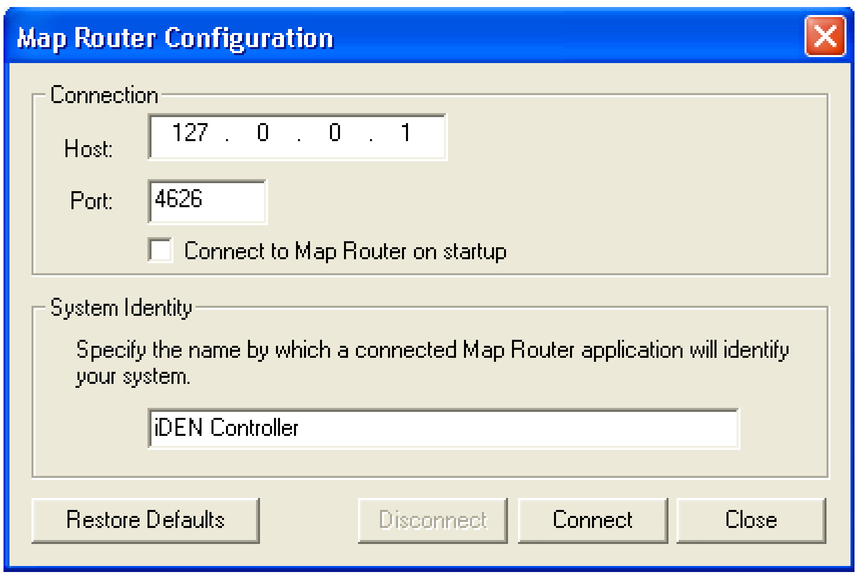


Figure 2-24. Configure Map Router

- Select **Close** to close the dialog

If there is a need to switch the Host IP Address and/or Port setting, Map Router application will also need to be configured with the same Host IP and/or Port settings.

NOTE
The default **Port** value is the same default **Port** value used by Map Router.

2-6 SETUP

The following procedure describes how to setup, configure and use Map Router:

Step 1. Launch Map Router by selecting the icon from the desktop or the Windows Task bar Notification Area. Map Router Main window displays as shown in the Figure 2-25.

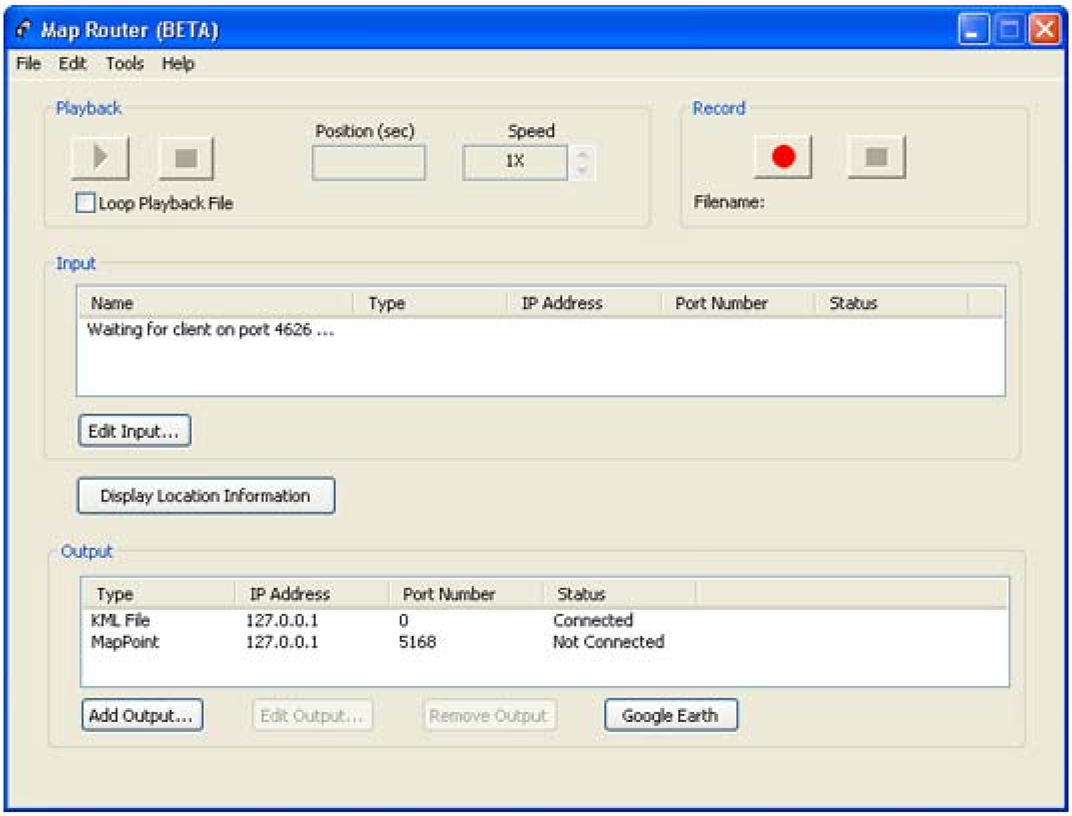


Figure 2-25. Map Router Main Window

- The Menu bar at the top of the window displays **File**, **Edit, Tools**, and **Help** menus

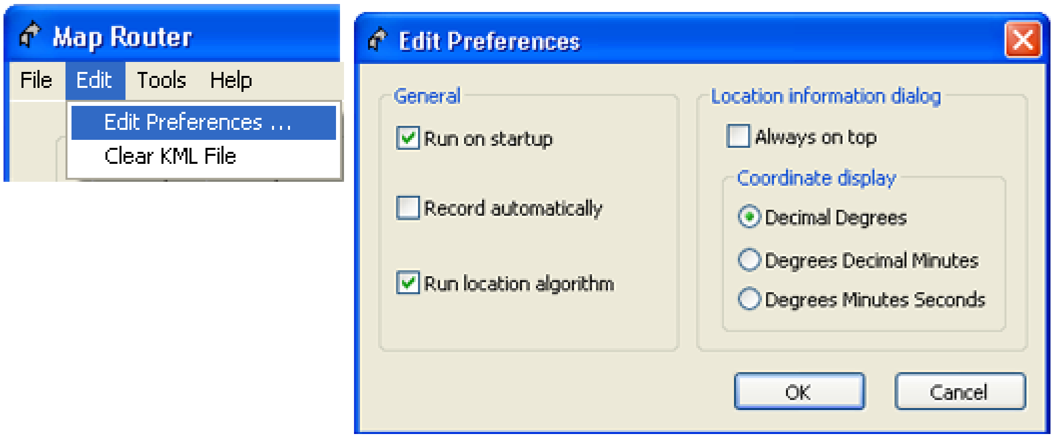


Figure 2-26. Map Router Edit Preferences

Step 2. Use the Menu bar to **Edit Preferences**, clear the KML file, display version information, and to exit Map Router.

- **File** – Contains the **Close** choice to exit Map Router
- **Edit** – Contains the **Edit Preferences** options to configure Map Router as shown in the Figure 2-26 and **Clear KML File**
- **Tools** – Contains the **Geographic Boundaries** options
- **Help** – Displays the **About** option (containing the version and copyright date)

2-7 MAIN WINDOW FUNCTIONS

Map Router Main window has the following five separate functional areas in addition to the Menu Bar:

1. **Playback** – This area is used to play back a prerecorded route as shown in the Figure 2-27
2. **Record** – Provides the **Start** and **Stop** buttons for the **Record** function

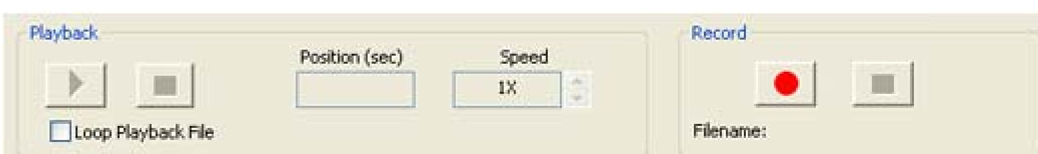


Figure 2-27. Map Router Playback and Record

3. **Input** – Data can be from the current network file or the user can choose to load an existing saved file. Selecting the **Edit Input** button as shown in the Figure 2-28) displays the **Edit Input** dialog

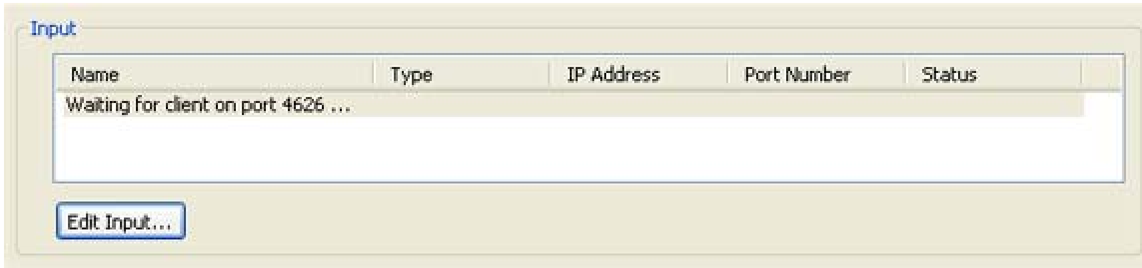


Figure 2-28. Map Router Input

4. Select the **Playback File** radio button and click the **Browse** button as shown in the Figure 2-29

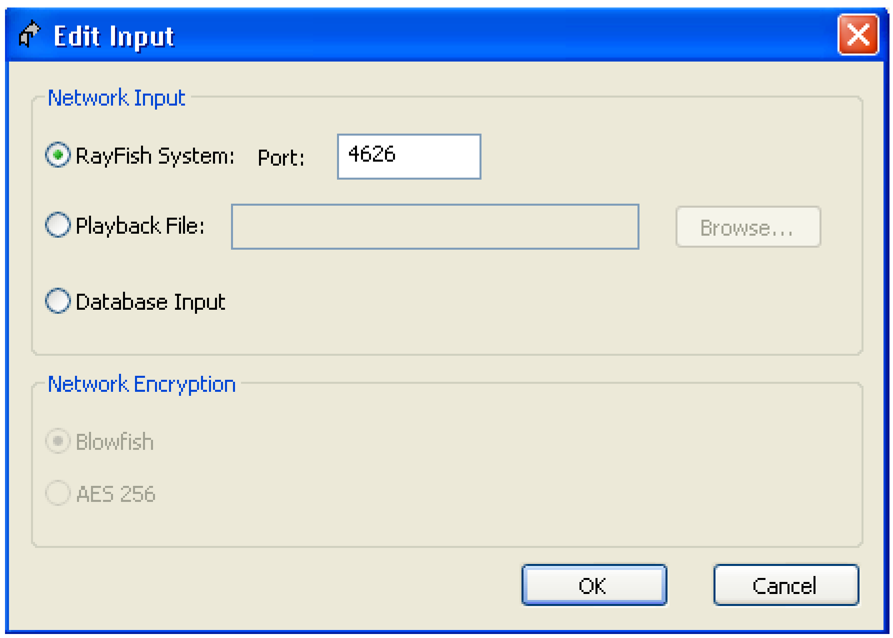


Figure 2-29. Edit Input Dialog

- To load an existing saved file, select the **Playback File** radio button, click **Browse**, navigate to the desired saved file, select **Open** and the **OK** button

5. **Display Location Configuration** button as shown in the Figure 2-30 – From Map Router main window, select this button to display the **Location Information** dialog

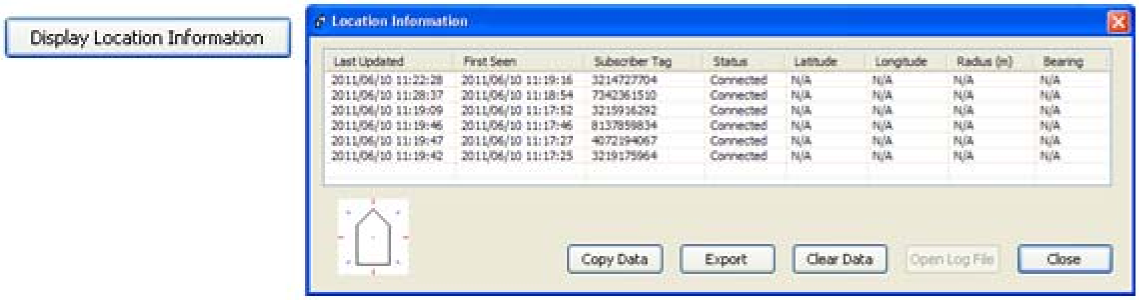


Figure 2-30. Display Location Information and Output

- The **Name** and **Status** is displayed during an MS DF operation
- The **Name** will display the active subscriber selected for the MS DF operation
- The **Status** field will display **N/A**, **Connected**, or **Lost**

6. **Output**
   - Output may be saved to a maximum of four network file connections
   - When Map Router displays one designated address, the **Add Output** button is activated
     - Selecting the **Add Output** button opens the **Add Output Connection** dialog as shown in the Figure 2-31

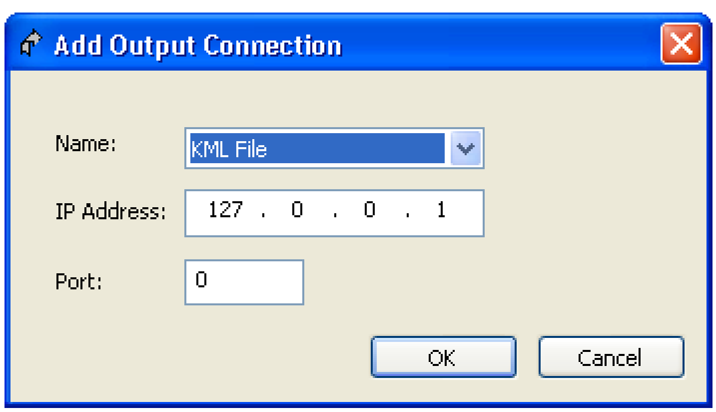


Figure 2-31. Add Output Connection Dialog

- Select an output Name from the drop down **Name** list
- Designating two connections on Map Router main window, activates the **Edit Output and Remove Output** buttons

- The **Edit Output** option allows the editing of the Connection's Name, IP Address, and Port
- Selecting the **Remove Output** button from Map Router main window, immediately deletes the highlighted connection

7. **Google Earth** – Google Earth is a virtual globe with maps and geographical data

- This is a Commercial Off-the-Shelf (COTS) product
- This application must be downloaded and installed separately
- This downloadable application can be located at http://earth.google.com/

2-8 MULTIPLE LOCATION FINDING ESTIMATE

Map Router is capable of calculating Location Finding estimates for multiple subscribers. Current Location Finding estimates for each enabled subscriber are sent to all enabled map outputs. Results for all subscribers are retained until the results are manually changed or the input to Map Router is changed. Results are manually cleared using the Clear Data button in the **Location Information** dialog as shown in the Figure 2-32.

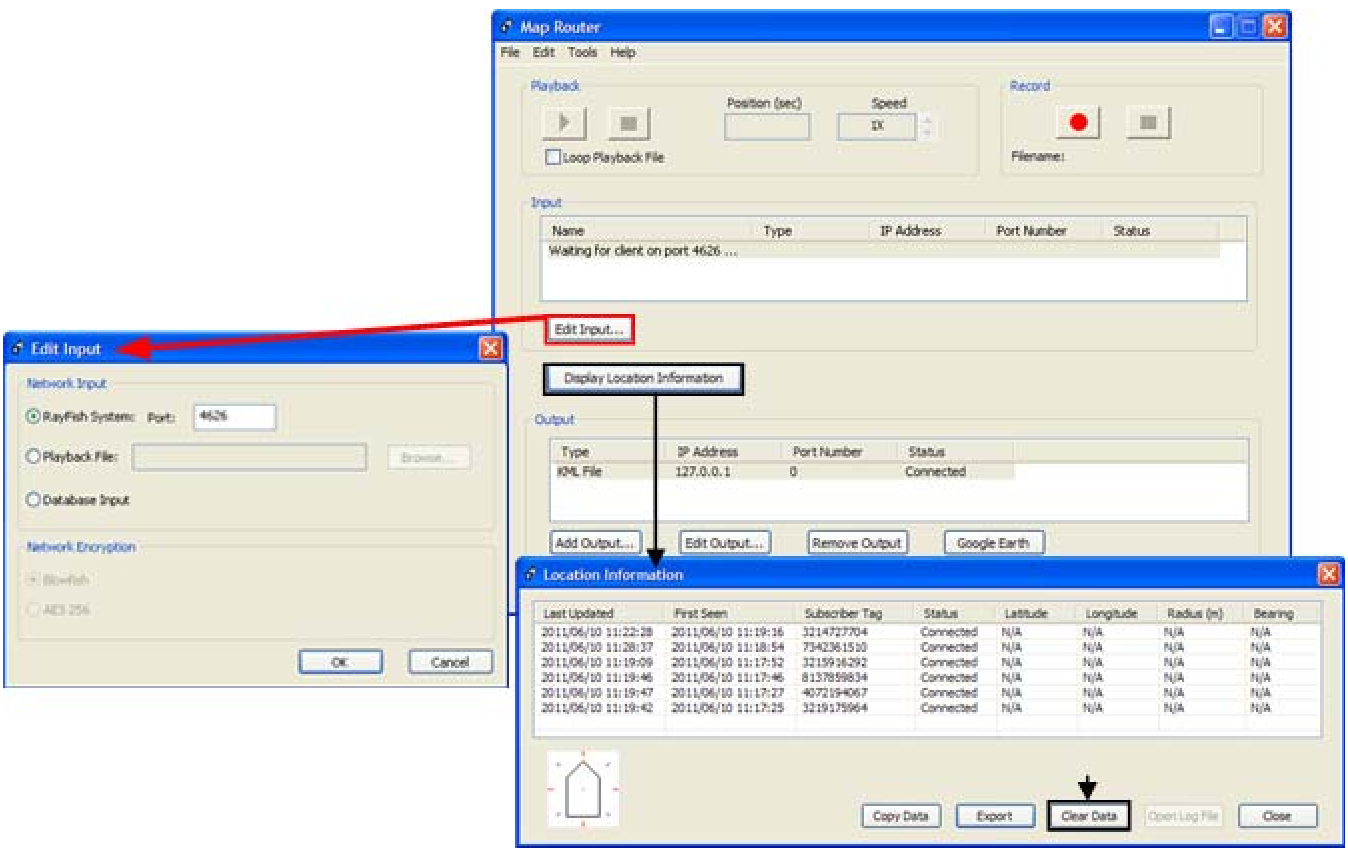


Figure 2-32. Clear Data and Edit Input

2-9 GEOGRAPHIC FILTER

The Geo-Filter as shown in the Figure 2-33 allows users to define a Geographic boundary. This boundary can be used to limit Location Finding solution outputs to only those falling inside of that region. The Geo-Filter can be applied in real time or during post-processing using Map Router playback files.

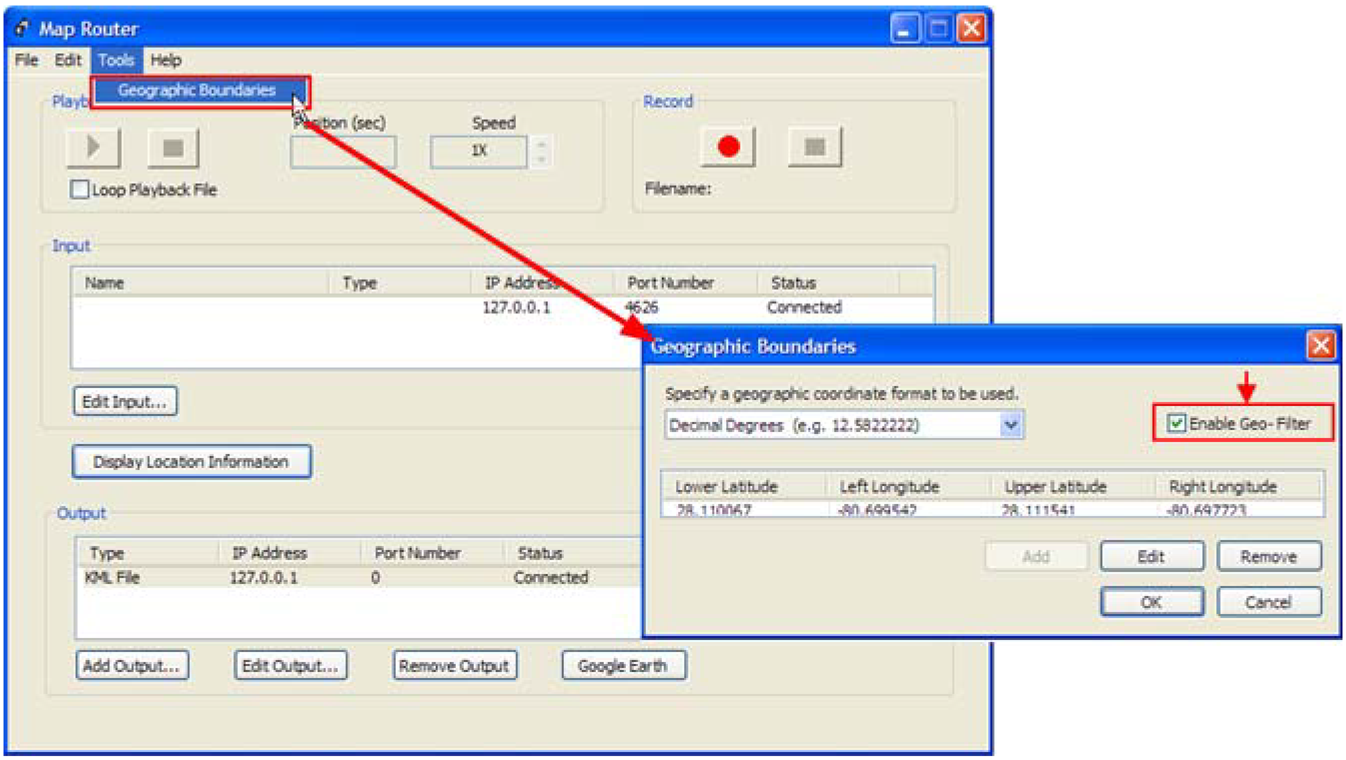


Figure 2-33. Enable Geo-Filter

2-10 MULTI-PLAYBACK FILE SUPPORT

Map Router supports combining multiple playback files into a single playback file.

To combine multiple Map Router playbacks into a single multi-playback file:

Step 1. Select the **Edit Input** button, as shown in the Figure 2-32.

Step 2. From the **Edit Input** dialog, select **Playback File** radio button.

Step 3. Browse to the location where your playback files are located (they must all be in the same folder).

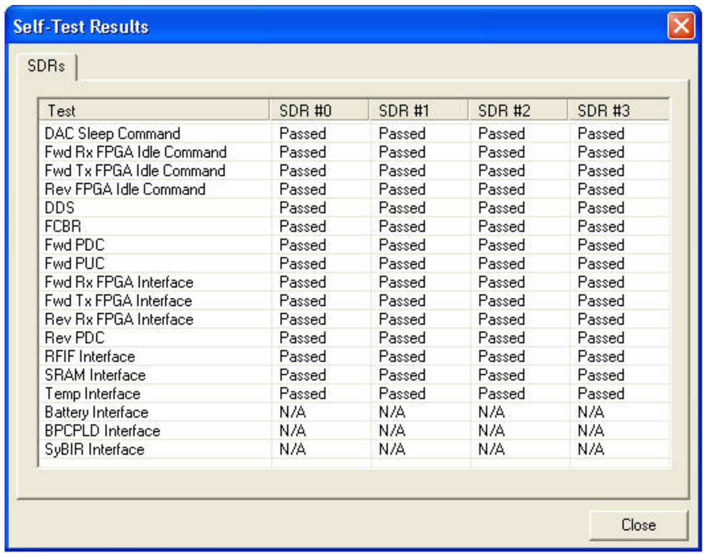
Step 4. Then select all of the files that are to be combined by holding the CNTRL or Shift key and selecting each file.

- When all of the desired files are selected, select the **Open** button
- The Multi-Playback file will be automatically loaded and ready for playback
- The files will be combined into a single Multi-Playback file (*.mpb) and saved in the same working directory

2-11 PERFORM SELF-TEST

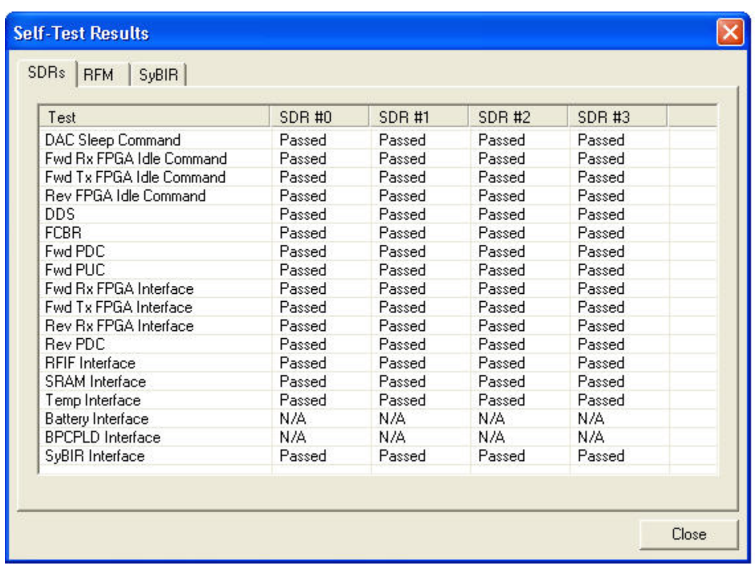
The Perform Self-Test action commands the SDRs to initialize and confirms hardware functionality.

- From the **Main** menu, select **Tools > Perform Self-Test**
- The **Self-Test Results** dialog displays the **SDRs** tab (see Figure 2-34 and Figure 2-35)



Test	SDR #0	SDR #1	SDR #2	SDR #3
DAC Sleep Command	Passed	Passed	Passed	Passed
Fwd Rx FPGA Idle Command	Passed	Passed	Passed	Passed
Fwd Tx FPGA Idle Command	Passed	Passed	Passed	Passed
Rev FPGA Idle Command	Passed	Passed	Passed	Passed
DDS	Passed	Passed	Passed	Passed
FCBR	Passed	Passed	Passed	Passed
Fwd PDC	Passed	Passed	Passed	Passed
Fwd PUC	Passed	Passed	Passed	Passed
Fwd Rx FPGA Interface	Passed	Passed	Passed	Passed
Fwd Tx FPGA Interface	Passed	Passed	Passed	Passed
Rev Rx FPGA Interface	Passed	Passed	Passed	Passed
Rev PDC	Passed	Passed	Passed	Passed
RFIF Interface	Passed	Passed	Passed	Passed
SRAM Interface	Passed	Passed	Passed	Passed
Temp Interface	Passed	Passed	Passed	Passed
Battery Interface	N/A	N/A	N/A	N/A
BPCPLD Interface	N/A	N/A	N/A	N/A
SyBIR Interface	N/A	N/A	N/A	N/A

Figure 2-34. SDRs Self-Test Results (StingRay/KingFish)



Test	SDR #0	SDR #1	SDR #2	SDR #3
DAC Sleep Command	Passed	Passed	Passed	Passed
Fwd Rx FPGA Idle Command	Passed	Passed	Passed	Passed
Fwd Tx FPGA Idle Command	Passed	Passed	Passed	Passed
Rev FPGA Idle Command	Passed	Passed	Passed	Passed
DDS	Passed	Passed	Passed	Passed
FCBR	Passed	Passed	Passed	Passed
Fwd PDC	Passed	Passed	Passed	Passed
Fwd PUC	Passed	Passed	Passed	Passed
Fwd Rx FPGA Interface	Passed	Passed	Passed	Passed
Fwd Tx FPGA Interface	Passed	Passed	Passed	Passed
Rev Rx FPGA Interface	Passed	Passed	Passed	Passed
Rev PDC	Passed	Passed	Passed	Passed
RFIF Interface	Passed	Passed	Passed	Passed
SRAM Interface	Passed	Passed	Passed	Passed
Temp Interface	Passed	Passed	Passed	Passed
Battery Interface	N/A	N/A	N/A	N/A
BPCPLD Interface	N/A	N/A	N/A	N/A
SyBIR Interface	Passed	Passed	Passed	Passed

Figure 2-35. SDRs Self-Test Results (StingRay II)

- **RFM** – Radio Frequency Module (StingRay II) (see Figure 2-36)

- **SyBIR** – Manages communication between the SDRs and provides chassis status (StingRay II) (see Figure 2-37)

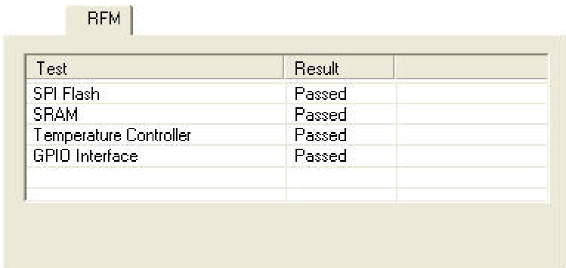


Figure 2-36. RFM Self-Test (StingRay II)

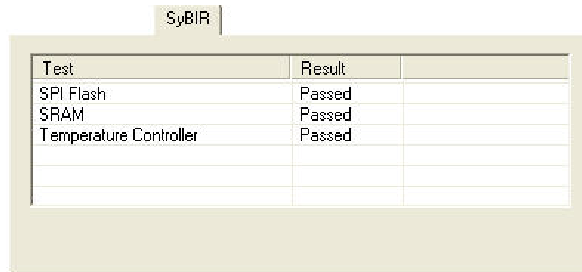


Figure 2-37. SyBIR Self-Test (StingRay II)

- Select the **Close** button to return to the Main window

2-12 ADVANCED BTS EDITOR

The **Advanced BTS Editor** emulates a Base Transceiver Station based on user-defined field parameters.

- From the **Main** menu, select **Tools > Advanced BTS Editor**
- The **Advanced BTS Editor** dialog box displays (see Figure 2-38). From here, the user can configure specific transmitted parameters to increase the flexibility of transmit modes. Detailed descriptions were presented previously in Paragraph 1-11.2 and Paragraph 1-12.2

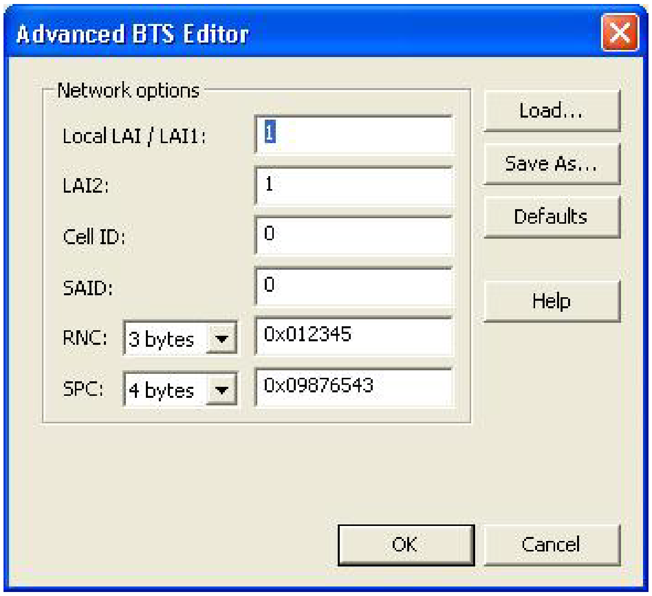


Figure 2-38. Advanced BTS Editor Dialog Box

2-13 NIGHT MODE DISPLAY OPTIONS

The iDEN Transceiver installs two Windows display themes (**Gray Night Theme** and **Green Night Theme**) to support reduced light emissions from the user interface display.

Step 1. To utilize a **Night Mode Windows** theme, Right Click on the desktop to bring up the Desktop Menu (see Figure 2-39).



Figure 2-39. Desktop Menu

Step 2. Select **Properties** to open the **Display Properties** screen with the **Themes** tab active (see Figure 2-40).

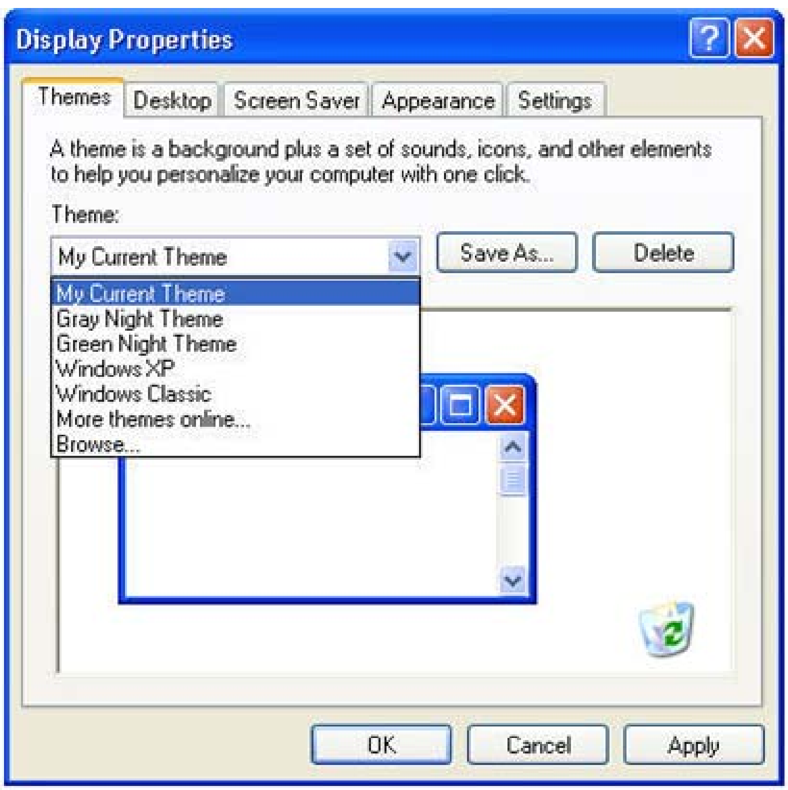


Figure 2-40. Display Properties Screen

Step 3. Scroll to and select the **Gray Night Theme** (see Figure 2-41) or the **Green Night Theme** (see Figure 2-42).



Figure 2-41. Gray Night Theme



Figure 2-42. Green Night Theme

A sample Main Screen using the **Gray Night Theme** is shown in Figure 2-43.

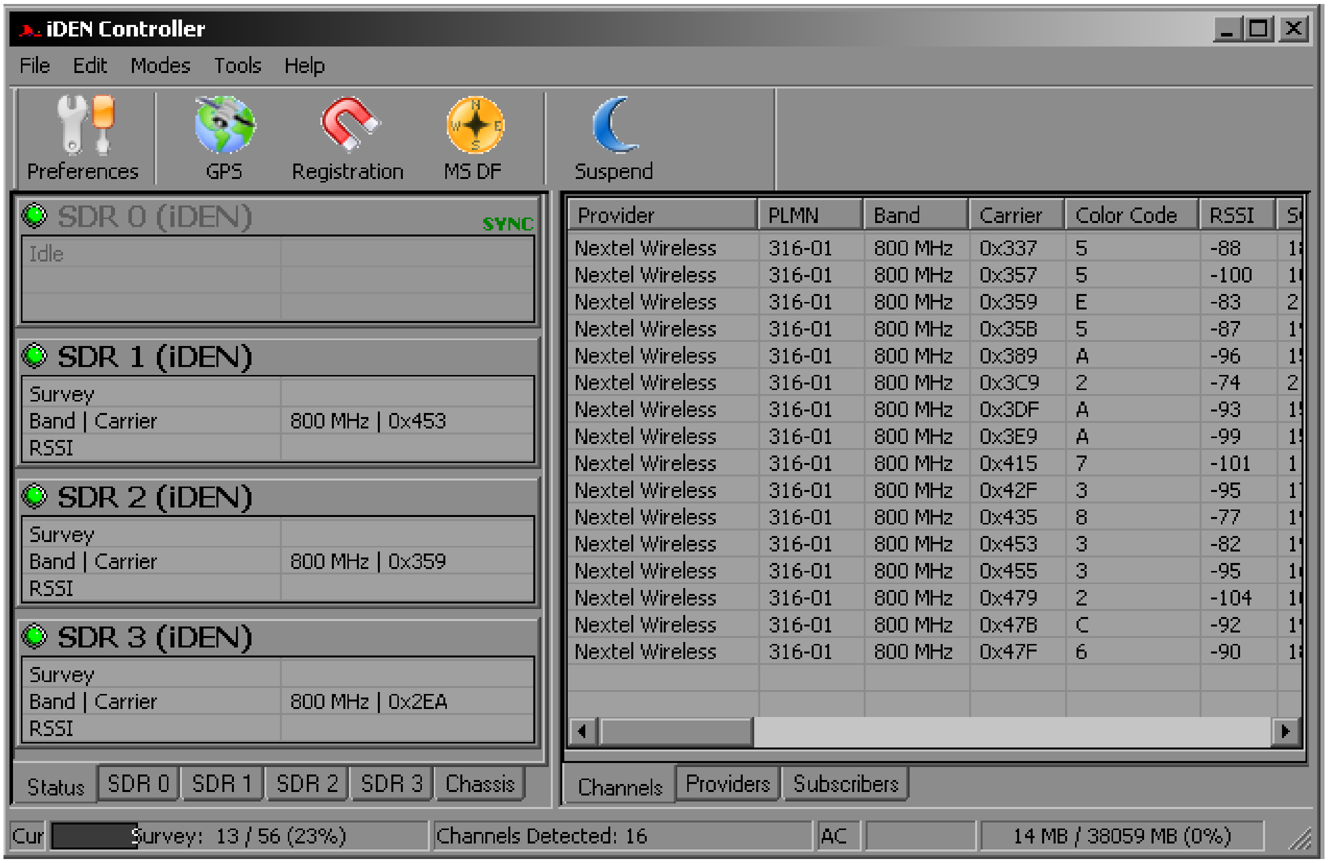


Figure 2-43. Gray Night Theme - Main Screen

2-14 ANALYZE NEIGHBORS FEATURE

The iDEN Transceiver provides a feature for identifying transmit channels within the area of interest for Registration and MS DF operations.

Step 1. To **Analyze Neighbors**, select the chosen channels and right click to display the pop-up (see Figure 2-44).

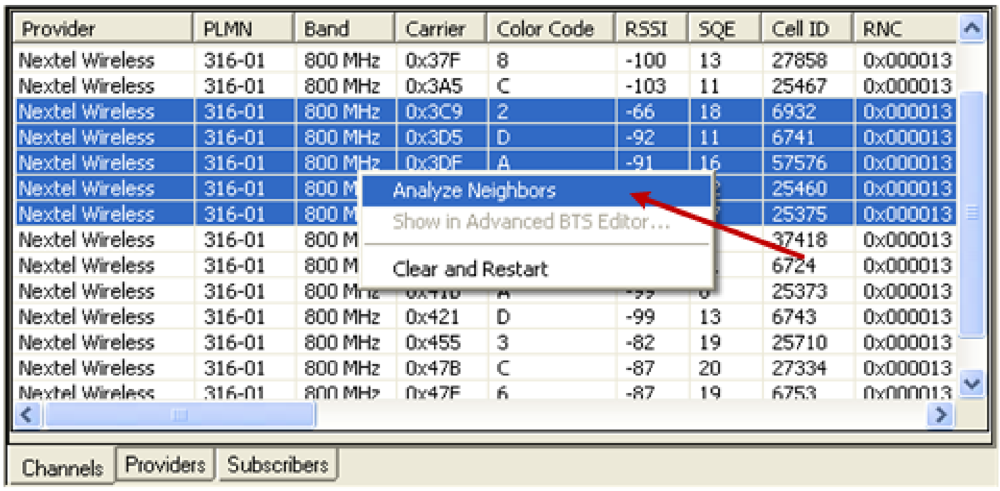


Figure 2-44. Analyze Neighbors

Step 2. Select **Analyze Neighbors** from the pop-up and the results are displayed in the **Neighbor Analysis View** (see Figure 2-45 and Table 2-1).

- Neighbor analysis shows the neighbor channel commonality for the channels specified in the Channels view
- The RSSI will be displayed for any base station neighbors that were decoded during Survey

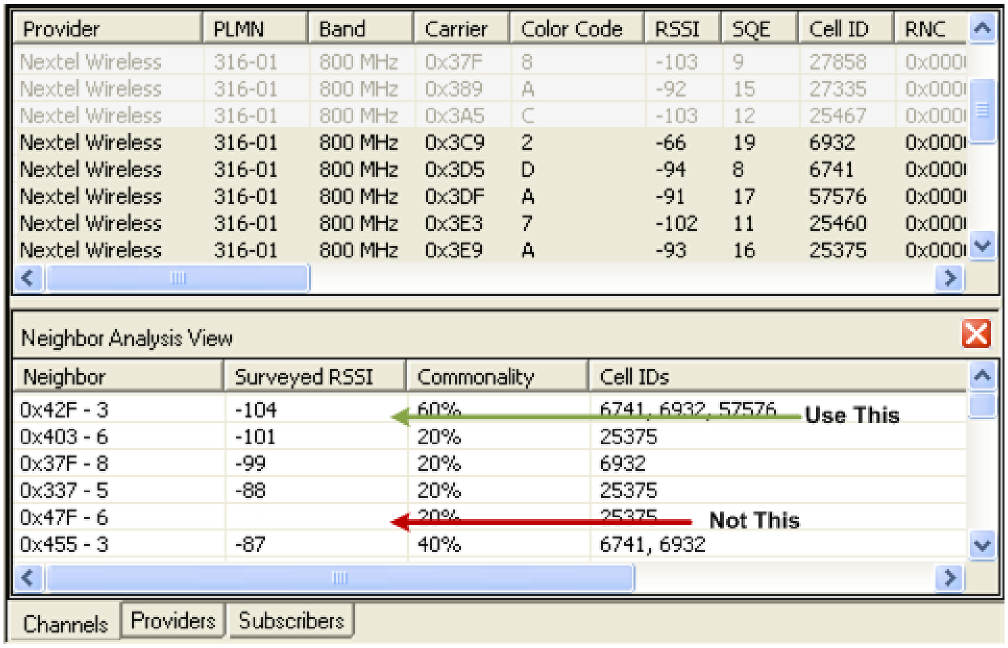


Figure 2-45. Neighbor Analysis Results

Table 2-1. Neighbor Analysis Results Data Columns

Column	Example	Explanation
Neighbor	0x33F - F	A neighbor of the highlighted channels
Commonality	33%	The percentage of the highlighted channels where the neighbor is included on the neighbor list
Surveyed RSSI	-97	The RSSI of the surveyed neighbor. No measurement indicates the neighbor was not surveyed
Cell IDs	6387	The cell ID for the highlighted channel where the neighbor is on the neighbor list

The user may run an Registration or MS DF operation from the **Neighbor Analysis View**.

Appendix

A TERMS AND DEFINITIONS

A-1 WHAT THIS APPENDIX CONTAINS

This appendix contains terms and definitions found in the iDEN Transceiver software. We depend on customer input to continuously add and update this section.

A

Access Channel - A Reverse iDEN Channel used by mobile stations for communicating to the Base Station. The Access Channel is used for short signaling message exchanges such as call originations, responses to pages, and registrations. The Access Channel is a slotted random access channel

Authentication (Auth) - A procedure used by a base station to validate a mobile station's identity

Analyze Neighbors - A tool for identifying transmit channels for Registration of MS DF

B

Base Class - A set of frequency channels and a numbering scheme for these channels. Cellular and PCS Base Classes are 0 and 1, respectively

BTS - Base Transceiver Station

C

Color Code - An identification affiliated with each channel, making each channel unique. Neighboring base stations will have different color code pairs assigned to their channels

iDEN Channel - The set of channels transmitted between the base station and the mobile stations within a given iDEN frequency assignment

Cell ID - Base Station identity within a local area

Code Channel - A sub channel of a Forward iDEN Channel. A Forward iDEN Channel contains 64 code channels. Code channels 1 through 7 may be assigned to the either Paging Channels or the Traffic Channels. Code channel 32 may be assigned to either a Sync Channel or a Traffic Channel. The remaining code channels may be assigned to Traffic Channels

D

DF - Direction Finding

dBm - Decibels above or below one milliwatt. Used to indicate receive signal strength

E

Event - An over-the-air cellular transaction from which logs Signal Related Information (SRI)

External PA - accessory that is used to boost the transmit power

I

IMEI - International Mobile Equipment Identity (IMEI)- 64-bit binary value that is programmed into the mobile telephone at time of manufacture. It includes serial number, country of production, and type approval

IMSI - See International Mobile Subscriber Identity.

International Mobile Subscriber Identity (IMSI) - A method of identifying stations in the land mobile service as specified in CCITT Recommendation E.212

Registration - An operational mode in which emulates a base station, forcing registrations from mobile phones to log identifying information

L

LAI - Location Area Identifier

M

MCC - Mobile Country Code

MS - Mobile Station (cell phone)

Mobile Base Station Survey - A series of Base Station Surveys that performs at user-defined intervals

N

Neighbor List - A list of neighbor PLMNs that a base station transmits to mobile phones to assist in handoff operations

Network Identification (NID) - A number that uniquely identifies a network within a cellular or PCS system. See also System Identification

NDC - Nationwide Direct Connect

P

Paging - The act of seeking a mobile station when a call has been placed to that mobile station

PCC - Personal Computer Controller

PLMN - Public Land Mobile Network (Combination of the MCC & NDC)

Provider - Cellular service provider

R

Registration - The process by which a mobile station identifies its location and parameters to a base station

Reverse iDEN Channel - A iDEN Channel from the mobile station to the base station that includes Access Channel(s) and Traffic Channels. Resync - A process by which performs a Base Station Survey to resynchronize with network timing

RFM - Radio Frequency Module

RNC - Regional Network Code

RSSI - Received Signal Strength Indicator, a measure of RF channel power expressed in dB

S

SAID - Service Area Identifier

SID - See System Identification

SPC - Service Provider Code

SQE - Signal Quality Estimate

Survey - See Base Station Survey

Survey Interval - The user-selected interval at which performs Base Station Surveys

Survey Type - The option used to perform a Base Station Survey (Stationary or Mobile)

SyBIR - Manages the communication between the SDRs and provides chassis status

Sync Channel - A code channel in a Forward iDEN Channel that transports the Synchronization Message to the mobile station

System - A block of iDEN Channels (a or b for cellular band; A, B, C, D, E, or F for PCS Band)

System Identification (SID) - A number uniquely identifying a cellular or PCS system

System Time - Current value of iDEN system time provided on the Sync Channel.

T

Tag - The name assigned to a subscribers phone

Subscriber - The subject of the operation identified by his/her mobile phone Min or ESN or by a Dialed Number

Transmit DF - Direction Finding technique that Transmits to an idle mobile phone (does not require the subscriber phone to be engaged in a call)

TX Power - Amount of RF power being transmitted in the MOBILE Transceiver mode. Options available are 0 to 24 dBm in 3 dB increments

V

VSWR - Voltage Standing Wave Ratio

Appendix B FREQUENCY TABLES

B-1 iDEN FREQUENCY TABLES

Table B-1 contains channels (carriers) and frequencies for the iDEN 800 MHz band.

Table B-1. iDEN Frequency Table

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
0	0X000	806.0000	851.0000
1	0X001	806.0125	851.0125
2	0X002	806.0250	851.0250
3	0X003	806.0375	851.0375
4	0X004	806.0500	851.0500
5	0X005	806.0625	851.0625
6	0X006	806.0750	851.0750
7	0X007	806.0875	851.0875
8	0X008	806.1000	851.1000
9	0X009	806.1125	851.1125
10	0X00A	806.1250	851.1250
11	0X00B	806.1375	851.1375
12	0X00C	806.1500	851.1500
13	0X00D	806.1625	851.1625
14	0X00E	806.1750	851.1750
15	0X00F	806.1875	851.1875
16	0X010	806.2000	851.2000
17	0X011	806.2125	851.2125
18	0X012	806.2250	851.2250
19	0X013	806.2375	851.2375
20	0X014	806.2500	851.2500
21	0X015	806.2625	851.2625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
22	0X016	806.2750	851.2750
23	0X017	806.2875	851.2875
24	0X018	806.3000	851.3000
25	0X019	806.3125	851.3125
26	0X01A	806.3250	851.3250
27	0X01B	806.3375	851.3375
28	0X01C	806.3500	851.3500
29	0X01D	806.3625	851.3625
30	0X01E	806.3750	851.3750
31	0X01F	806.3875	851.3875
32	0X020	806.4000	851.4000
33	0X021	806.4125	851.4125
34	0X022	806.4250	851.4250
35	0X023	806.4375	851.4375
36	0X024	806.4500	851.4500
37	0X025	806.4625	851.4625
38	0X026	806.4750	851.4750
39	0X027	806.4875	851.4875
40	0X028	806.5000	851.5000
41	0X029	806.5125	851.5125
42	0X02A	806.5250	851.5250
43	0X02B	806.5375	851.5375
44	0X02C	806.5500	851.5500
45	0X02D	806.5625	851.5625
46	0X02E	806.5750	851.5750
47	0X02F	806.5875	851.5875
48	0X030	806.6000	851.6000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
49	0X031	806.6125	851.6125
50	0X032	806.6250	851.6250
51	0X033	806.6375	851.6375
52	0X034	806.6500	851.6500
53	0X035	806.6625	851.6625
54	0X036	806.6750	851.6750
55	0X037	806.6875	851.6875
56	0X038	806.7000	851.7000
57	0X039	806.7125	851.7125
58	0X03A	806.7250	851.7250
59	0X03B	806.7375	851.7375
60	0X03C	806.7500	851.7500
61	0X03D	806.7625	851.7625
62	0X03E	806.7750	851.7750
63	0X03F	806.7875	851.7875
64	0X040	806.8000	851.8000
65	0X041	806.8125	851.8125
66	0X042	806.8250	851.8250
67	0X043	806.8375	851.8375
68	0X044	806.8500	851.8500
69	0X045	806.8625	851.8625
70	0X046	806.8750	851.8750
71	0X047	806.8875	851.8875
72	0X048	806.9000	851.9000
73	0X049	806.9125	851.9125
74	0X04A	806.9250	851.9250
75	0X04B	806.9375	851.9375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
76	0X04C	806.9500	851.9500
77	0X04D	806.9625	851.9625
78	0X04E	806.9750	851.9750
79	0X04F	806.9875	851.9875
80	0X050	807.0000	852.0000
81	0X051	807.0125	852.0125
82	0X052	807.0250	852.0250
83	0X053	807.0375	852.0375
84	0X054	807.0500	852.0500
85	0X055	807.0625	852.0625
86	0X056	807.0750	852.0750
87	0X057	807.0875	852.0875
88	0X058	807.1000	852.1000
89	0X059	807.1125	852.1125
90	0X05A	807.1250	852.1250
91	0X05B	807.1375	852.1375
92	0X05C	807.1500	852.1500
93	0X05D	807.1625	852.1625
94	0X05E	807.1750	852.1750
95	0X05F	807.1875	852.1875
96	0X060	807.2000	852.2000
97	0X061	807.2125	852.2125
98	0X062	807.2250	852.2250
99	0X063	807.2375	852.2375
100	0X064	807.2500	852.2500
101	0X065	807.2625	852.2625
102	0X066	807.2750	852.2750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
103	0X067	807.2875	852.2875
104	0X068	807.3000	852.3000
105	0X069	807.3125	852.3125
106	0X06A	807.3250	852.3250
107	0X06B	807.3375	852.3375
108	0X06C	807.3500	852.3500
109	0X06D	807.3625	852.3625
110	0X06E	807.3750	852.3750
111	0X06F	807.3875	852.3875
112	0X070	807.4000	852.4000
113	0X071	807.4125	852.4125
114	0X072	807.4250	852.4250
115	0X073	807.4375	852.4375
116	0X074	807.4500	852.4500
117	0X075	807.4625	852.4625
118	0X076	807.4750	852.4750
119	0X077	807.4875	852.4875
120	0X078	807.5000	852.5000
121	0X079	807.5125	852.5125
122	0X07A	807.5250	852.5250
123	0X07B	807.5375	852.5375
124	0X07C	807.5500	852.5500
125	0X07D	807.5625	852.5625
126	0X07E	807.5750	852.5750
127	0X07F	807.5875	852.5875
128	0X080	807.6000	852.6000
129	0X081	807.6125	852.6125

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
130	0X082	807.6250	852.6250
131	0X083	807.6375	852.6375
132	0X084	807.6500	852.6500
133	0X085	807.6625	852.6625
134	0X086	807.6750	852.6750
135	0X087	807.6875	852.6875
136	0X088	807.7000	852.7000
137	0X089	807.7125	852.7125
138	0X08A	807.7250	852.7250
139	0X08B	807.7375	852.7375
140	0X08C	807.7500	852.7500
141	0X08D	807.7625	852.7625
142	0X08E	807.7750	852.7750
143	0X08F	807.7875	852.7875
144	0X090	807.8000	852.8000
145	0X091	807.8125	852.8125
146	0X092	807.8250	852.8250
147	0X093	807.8375	852.8375
148	0X094	807.8500	852.8500
149	0X095	807.8625	852.8625
150	0X096	807.8750	852.8750
151	0X097	807.8875	852.8875
152	0X098	807.9000	852.9000
153	0X099	807.9125	852.9125
154	0X09A	807.9250	852.9250
155	0X09B	807.9375	852.9375
156	0X09C	807.9500	852.9500

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
157	0X09D	807.9625	852.9625
158	0X09E	807.9750	852.9750
159	0X09F	807.9875	852.9875
160	0X0A0	808.0000	853.0000
161	0X0A1	808.0125	853.0125
162	0X0A2	808.0250	853.0250
163	0X0A3	808.0375	853.0375
164	0X0A4	808.0500	853.0500
165	0X0A5	808.0625	853.0625
166	0X0A6	808.0750	853.0750
167	0X0A7	808.0875	853.0875
168	0X0A8	808.1000	853.1000
169	0X0A9	808.1125	853.1125
170	0X0AA	808.1250	853.1250
171	0X0AB	808.1375	853.1375
172	0X0AC	808.1500	853.1500
173	0X0AD	808.1625	853.1625
174	0X0AE	808.1750	853.1750
175	0X0AF	808.1875	853.1875
176	0X0B0	808.2000	853.2000
177	0X0B1	808.2125	853.2125
178	0X0B2	808.2250	853.2250
179	0X0B3	808.2375	853.2375
180	0X0B4	808.2500	853.2500
181	0X0B5	808.2625	853.2625
182	0X0B6	808.2750	853.2750
183	0X0B7	808.2875	853.2875

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
184	0X0B8	808.3000	853.3000
185	0X0B9	808.3125	853.3125
186	0X0BA	808.3250	853.3250
187	0X0BB	808.3375	853.3375
188	0X0BC	808.3500	853.3500
189	0X0BD	808.3625	853.3625
190	0X0BE	808.3750	853.3750
191	0X0BF	808.3875	853.3875
192	0X0C0	808.4000	853.4000
193	0X0C1	808.4125	853.4125
194	0X0C2	808.4250	853.4250
195	0X0C3	808.4375	853.4375
196	0X0C4	808.4500	853.4500
197	0X0C5	808.4625	853.4625
198	0X0C6	808.4750	853.4750
199	0X0C7	808.4875	853.4875
200	0X0C8	808.5000	853.5000
201	0X0C9	808.5125	853.5125
202	0X0CA	808.5250	853.5250
203	0X0CB	808.5375	853.5375
204	0X0CC	808.5500	853.5500
205	0X0CD	808.5625	853.5625
206	0X0CE	808.5750	853.5750
207	0X0CF	808.5875	853.5875
208	0X0D0	808.6000	853.6000
209	0X0D1	808.6125	853.6125
210	0X0D2	808.6250	853.6250

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
211	0X0D3	808.6375	853.6375
212	0X0D4	808.6500	853.6500
213	0X0D5	808.6625	853.6625
214	0X0D6	808.6750	853.6750
215	0X0D7	808.6875	853.6875
216	0X0D8	808.7000	853.7000
217	0X0D9	808.7125	853.7125
218	0X0DA	808.7250	853.7250
219	0X0DB	808.7375	853.7375
220	0X0DC	808.7500	853.7500
221	0X0DD	808.7625	853.7625
222	0X0DE	808.7750	853.7750
223	0X0DF	808.7875	853.7875
224	0X0E0	808.8000	853.8000
225	0X0E1	808.8125	853.8125
226	0X0E2	808.8250	853.8250
227	0X0E3	808.8375	853.8375
228	0X0E4	808.8500	853.8500
229	0X0E5	808.8625	853.8625
230	0X0E6	808.8750	853.8750
231	0X0E7	808.8875	853.8875
232	0X0E8	808.9000	853.9000
233	0X0E9	808.9125	853.9125
234	0X0EA	808.9250	853.9250
235	0X0EB	808.9375	853.9375
236	0X0EC	808.9500	853.9500
237	0X0ED	808.9625	853.9625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
238	0X0EE	808.9750	853.9750
239	0X0EF	808.9875	853.9875
240	0X0F0	809.0000	854.0000
241	0X0F1	809.0125	854.0125
242	0X0F2	809.0250	854.0250
243	0X0F3	809.0375	854.0375
244	0X0F4	809.0500	854.0500
245	0X0F5	809.0625	854.0625
246	0X0F6	809.0750	854.0750
247	0X0F7	809.0875	854.0875
248	0X0F8	809.1000	854.1000
249	0X0F9	809.1125	854.1125
250	0X0FA	809.1250	854.1250
251	0X0FB	809.1375	854.1375
252	0X0FC	809.1500	854.1500
253	0X0FD	809.1625	854.1625
254	0X0FE	809.1750	854.1750
255	0X0FF	809.1875	854.1875
256	0X100	809.2000	854.2000
257	0X101	809.2125	854.2125
258	0X102	809.2250	854.2250
259	0X103	809.2375	854.2375
260	0X104	809.2500	854.2500
261	0X105	809.2625	854.2625
262	0X106	809.2750	854.2750
263	0X107	809.2875	854.2875
264	0X108	809.3000	854.3000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
265	0X109	809.3125	854.3125
266	0X10A	809.3250	854.3250
267	0X10B	809.3375	854.3375
268	0X10C	809.3500	854.3500
269	0X10D	809.3625	854.3625
270	0X10E	809.3750	854.3750
271	0X10F	809.3875	854.3875
272	0X110	809.4000	854.4000
273	0X111	809.4125	854.4125
274	0X112	809.4250	854.4250
275	0X113	809.4375	854.4375
276	0X114	809.4500	854.4500
277	0X115	809.4625	854.4625
278	0X116	809.4750	854.4750
279	0X117	809.4875	854.4875
280	0X118	809.5000	854.5000
281	0X119	809.5125	854.5125
282	0X11A	809.5250	854.5250
283	0X11B	809.5375	854.5375
284	0X11C	809.5500	854.5500
285	0X11D	809.5625	854.5625
286	0X11E	809.5750	854.5750
287	0X11F	809.5875	854.5875
288	0X120	809.6000	854.6000
289	0X121	809.6125	854.6125
290	0X122	809.6250	854.6250
291	0X123	809.6375	854.6375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
292	0X124	809.6500	854.6500
293	0X125	809.6625	854.6625
294	0X126	809.6750	854.6750
295	0X127	809.6875	854.6875
296	0X128	809.7000	854.7000
297	0X129	809.7125	854.7125
298	0X12A	809.7250	854.7250
299	0X12B	809.7375	854.7375
300	0X12C	809.7500	854.7500
301	0X12D	809.7625	854.7625
302	0X12E	809.7750	854.7750
303	0X12F	809.7875	854.7875
304	0X130	809.8000	854.8000
305	0X131	809.8125	854.8125
306	0X132	809.8250	854.8250
307	0X133	809.8375	854.8375
308	0X134	809.8500	854.8500
309	0X135	809.8625	854.8625
310	0X136	809.8750	854.8750
311	0X137	809.8875	854.8875
312	0X138	809.9000	854.9000
313	0X139	809.9125	854.9125
314	0X13A	809.9250	854.9250
315	0X13B	809.9375	854.9375
316	0X13C	809.9500	854.9500
317	0X13D	809.9625	854.9625
318	0X13E	809.9750	854.9750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
319	0X13F	809.9875	854.9875
320	0X140	810.0000	855.0000
321	0X141	810.0125	855.0125
322	0X142	810.0250	855.0250
323	0X143	810.0375	855.0375
324	0X144	810.0500	855.0500
325	0X145	810.0625	855.0625
326	0X146	810.0750	855.0750
327	0X147	810.0875	855.0875
328	0X148	810.1000	855.1000
329	0X149	810.1125	855.1125
330	0X14A	810.1250	855.1250
331	0X14B	810.1375	855.1375
332	0X14C	810.1500	855.1500
333	0X14D	810.1625	855.1625
334	0X14E	810.1750	855.1750
335	0X14F	810.1875	855.1875
336	0X150	810.2000	855.2000
337	0X151	810.2125	855.2125
338	0X152	810.2250	855.2250
339	0X153	810.2375	855.2375
340	0X154	810.2500	855.2500
341	0X155	810.2625	855.2625
342	0X156	810.2750	855.2750
343	0X157	810.2875	855.2875
344	0X158	810.3000	855.3000
345	0X159	810.3125	855.3125

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
346	0X15A	810.3250	855.3250
347	0X15B	810.3375	855.3375
348	0X15C	810.3500	855.3500
349	0X15D	810.3625	855.3625
350	0X15E	810.3750	855.3750
351	0X15F	810.3875	855.3875
352	0X160	810.4000	855.4000
353	0X161	810.4125	855.4125
354	0X162	810.4250	855.4250
355	0X163	810.4375	855.4375
356	0X164	810.4500	855.4500
357	0X165	810.4625	855.4625
358	0X166	810.4750	855.4750
359	0X167	810.4875	855.4875
360	0X168	810.5000	855.5000
361	0X169	810.5125	855.5125
362	0X16A	810.5250	855.5250
363	0X16B	810.5375	855.5375
364	0X16C	810.5500	855.5500
365	0X16D	810.5625	855.5625
366	0X16E	810.5750	855.5750
367	0X16F	810.5875	855.5875
368	0X170	810.6000	855.6000
369	0X171	810.6125	855.6125
370	0X172	810.6250	855.6250
371	0X173	810.6375	855.6375
372	0X174	810.6500	855.6500

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
373	0X175	810.6625	855.6625
374	0X176	810.6750	855.6750
375	0X177	810.6875	855.6875
376	0X178	810.7000	855.7000
377	0X179	810.7125	855.7125
378	0X17A	810.7250	855.7250
379	0X17B	810.7375	855.7375
380	0X17C	810.7500	855.7500
381	0X17D	810.7625	855.7625
382	0X17E	810.7750	855.7750
383	0X17F	810.7875	855.7875
384	0X180	810.8000	855.8000
385	0X181	810.8125	855.8125
386	0X182	810.8250	855.8250
387	0X183	810.8375	855.8375
388	0X184	810.8500	855.8500
389	0X185	810.8625	855.8625
390	0X186	810.8750	855.8750
391	0X187	810.8875	855.8875
392	0X188	810.9000	855.9000
393	0X189	810.9125	855.9125
394	0X18A	810.9250	855.9250
395	0X18B	810.9375	855.9375
396	0X18C	810.9500	855.9500
397	0X18D	810.9625	855.9625
398	0X18E	810.9750	855.9750
399	0X18F	810.9875	855.9875

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
400	0X190	811.0000	856.0000
401	0X191	811.0125	856.0125
402	0X192	811.0250	856.0250
403	0X193	811.0375	856.0375
404	0X194	811.0500	856.0500
405	0X195	811.0625	856.0625
406	0X196	811.0750	856.0750
407	0X197	811.0875	856.0875
408	0X198	811.1000	856.1000
409	0X199	811.1125	856.1125
410	0X19A	811.1250	856.1250
411	0X19B	811.1375	856.1375
412	0X19C	811.1500	856.1500
413	0X19D	811.1625	856.1625
414	0X19E	811.1750	856.1750
415	0X19F	811.1875	856.1875
416	0X1A0	811.2000	856.2000
417	0X1A1	811.2125	856.2125
418	0X1A2	811.2250	856.2250
419	0X1A3	811.2375	856.2375
420	0X1A4	811.2500	856.2500
421	0X1A5	811.2625	856.2625
422	0X1A6	811.2750	856.2750
423	0X1A7	811.2875	856.2875
424	0X1A8	811.3000	856.3000
425	0X1A9	811.3125	856.3125
426	0X1AA	811.3250	856.3250

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
427	0X1AB	811.3375	856.3375
428	0X1AC	811.3500	856.3500
429	0X1AD	811.3625	856.3625
430	0X1AE	811.3750	856.3750
431	0X1AF	811.3875	856.3875
432	0X1B0	811.4000	856.4000
433	0X1B1	811.4125	856.4125
434	0X1B2	811.4250	856.4250
435	0X1B3	811.4375	856.4375
436	0X1B4	811.4500	856.4500
437	0X1B5	811.4625	856.4625
438	0X1B6	811.4750	856.4750
439	0X1B7	811.4875	856.4875
440	0X1B8	811.5000	856.5000
441	0X1B9	811.5125	856.5125
442	0X1BA	811.5250	856.5250
443	0X1BB	811.5375	856.5375
444	0X1BC	811.5500	856.5500
445	0X1BD	811.5625	856.5625
446	0X1BE	811.5750	856.5750
447	0X1BF	811.5875	856.5875
448	0X1C0	811.6000	856.6000
449	0X1C1	811.6125	856.6125
450	0X1C2	811.6250	856.6250
451	0X1C3	811.6375	856.6375
452	0X1C4	811.6500	856.6500
453	0X1C5	811.6625	856.6625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
454	0X1C6	811.6750	856.6750
455	0X1C7	811.6875	856.6875
456	0X1C8	811.7000	856.7000
457	0X1C9	811.7125	856.7125
458	0X1CA	811.7250	856.7250
459	0X1CB	811.7375	856.7375
460	0X1CC	811.7500	856.7500
461	0X1CD	811.7625	856.7625
462	0X1CE	811.7750	856.7750
463	0X1CF	811.7875	856.7875
464	0X1D0	811.8000	856.8000
465	0X1D1	811.8125	856.8125
466	0X1D2	811.8250	856.8250
467	0X1D3	811.8375	856.8375
468	0X1D4	811.8500	856.8500
469	0X1D5	811.8625	856.8625
470	0X1D6	811.8750	856.8750
471	0X1D7	811.8875	856.8875
472	0X1D8	811.9000	856.9000
473	0X1D9	811.9125	856.9125
474	0X1DA	811.9250	856.9250
475	0X1DB	811.9375	856.9375
476	0X1DC	811.9500	856.9500
477	0X1DD	811.9625	856.9625
478	0X1DE	811.9750	856.9750
479	0X1DF	811.9875	856.9875
480	0X1E0	812.0000	857.0000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
481	0X1E1	812.0125	857.0125
482	0X1E2	812.0250	857.0250
483	0X1E3	812.0375	857.0375
484	0X1E4	812.0500	857.0500
485	0X1E5	812.0625	857.0625
486	0X1E6	812.0750	857.0750
487	0X1E7	812.0875	857.0875
488	0X1E8	812.1000	857.1000
489	0X1E9	812.1125	857.1125
490	0X1EA	812.1250	857.1250
491	0X1EB	812.1375	857.1375
492	0X1EC	812.1500	857.1500
493	0X1ED	812.1625	857.1625
494	0X1EE	812.1750	857.1750
495	0X1EF	812.1875	857.1875
496	0X1F0	812.2000	857.2000
497	0X1F1	812.2125	857.2125
498	0X1F2	812.2250	857.2250
499	0X1F3	812.2375	857.2375
500	0X1F4	812.2500	857.2500
501	0X1F5	812.2625	857.2625
502	0X1F6	812.2750	857.2750
503	0X1F7	812.2875	857.2875
504	0X1F8	812.3000	857.3000
505	0X1F9	812.3125	857.3125
506	0X1FA	812.3250	857.3250
507	0X1FB	812.3375	857.3375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
508	0X1FC	812.3500	857.3500
509	0X1FD	812.3625	857.3625
510	0X1FE	812.3750	857.3750
511	0X1FF	812.3875	857.3875
512	0X200	812.4000	857.4000
513	0X201	812.4125	857.4125
514	0X202	812.4250	857.4250
515	0X203	812.4375	857.4375
516	0X204	812.4500	857.4500
517	0X205	812.4625	857.4625
518	0X206	812.4750	857.4750
519	0X207	812.4875	857.4875
520	0X208	812.5000	857.5000
521	0X209	812.5125	857.5125
522	0X20A	812.5250	857.5250
523	0X20B	812.5375	857.5375
524	0X20C	812.5500	857.5500
525	0X20D	812.5625	857.5625
526	0X20E	812.5750	857.5750
527	0X20F	812.5875	857.5875
528	0X210	812.6000	857.6000
529	0X211	812.6125	857.6125
530	0X212	812.6250	857.6250
531	0X213	812.6375	857.6375
532	0X214	812.6500	857.6500
533	0X215	812.6625	857.6625
534	0X216	812.6750	857.6750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
535	0X217	812.6875	857.6875
536	0X218	812.7000	857.7000
537	0X219	812.7125	857.7125
538	0X21A	812.7250	857.7250
539	0X21B	812.7375	857.7375
540	0X21C	812.7500	857.7500
541	0X21D	812.7625	857.7625
542	0X21E	812.7750	857.7750
543	0X21F	812.7875	857.7875
544	0X220	812.8000	857.8000
545	0X221	812.8125	857.8125
546	0X222	812.8250	857.8250
547	0X223	812.8375	857.8375
548	0X224	812.8500	857.8500
549	0X225	812.8625	857.8625
550	0X226	812.8750	857.8750
551	0X227	812.8875	857.8875
552	0X228	812.9000	857.9000
553	0X229	812.9125	857.9125
554	0X22A	812.9250	857.9250
555	0X22B	812.9375	857.9375
556	0X22C	812.9500	857.9500
557	0X22D	812.9625	857.9625
558	0X22E	812.9750	857.9750
559	0X22F	812.9875	857.9875
560	0X230	813.0000	858.0000
561	0X231	813.0125	858.0125

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
562	0X232	813.0250	858.0250
563	0X233	813.0375	858.0375
564	0X234	813.0500	858.0500
565	0X235	813.0625	858.0625
566	0X236	813.0750	858.0750
567	0X237	813.0875	858.0875
568	0X238	813.1000	858.1000
569	0X239	813.1125	858.1125
570	0X23A	813.1250	858.1250
571	0X23B	813.1375	858.1375
572	0X23C	813.1500	858.1500
573	0X23D	813.1625	858.1625
574	0X23E	813.1750	858.1750
575	0X23F	813.1875	858.1875
576	0X240	813.2000	858.2000
577	0X241	813.2125	858.2125
578	0X242	813.2250	858.2250
579	0X243	813.2375	858.2375
580	0X244	813.2500	858.2500
581	0X245	813.2625	858.2625
582	0X246	813.2750	858.2750
583	0X247	813.2875	858.2875
584	0X248	813.3000	858.3000
585	0X249	813.3125	858.3125
586	0X24A	813.3250	858.3250
587	0X24B	813.3375	858.3375
588	0X24C	813.3500	858.3500

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
589	0X24D	813.3625	858.3625
590	0X24E	813.3750	858.3750
591	0X24F	813.3875	858.3875
592	0X250	813.4000	858.4000
593	0X251	813.4125	858.4125
594	0X252	813.4250	858.4250
595	0X253	813.4375	858.4375
596	0X254	813.4500	858.4500
597	0X255	813.4625	858.4625
598	0X256	813.4750	858.4750
599	0X257	813.4875	858.4875
600	0X258	813.5000	858.5000
601	0X259	813.5125	858.5125
602	0X25A	813.5250	858.5250
603	0X25B	813.5375	858.5375
604	0X25C	813.5500	858.5500
605	0X25D	813.5625	858.5625
606	0X25E	813.5750	858.5750
607	0X25F	813.5875	858.5875
608	0X260	813.6000	858.6000
609	0X261	813.6125	858.6125
610	0X262	813.6250	858.6250
611	0X263	813.6375	858.6375
612	0X264	813.6500	858.6500
613	0X265	813.6625	858.6625
614	0X266	813.6750	858.6750
615	0X267	813.6875	858.6875

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
616	0X268	813.7000	858.7000
617	0X269	813.7125	858.7125
618	0X26A	813.7250	858.7250
619	0X26B	813.7375	858.7375
620	0X26C	813.7500	858.7500
621	0X26D	813.7625	858.7625
622	0X26E	813.7750	858.7750
623	0X26F	813.7875	858.7875
624	0X270	813.8000	858.8000
625	0X271	813.8125	858.8125
626	0X272	813.8250	858.8250
627	0X273	813.8375	858.8375
628	0X274	813.8500	858.8500
629	0X275	813.8625	858.8625
630	0X276	813.8750	858.8750
631	0X277	813.8875	858.8875
632	0X278	813.9000	858.9000
633	0X279	813.9125	858.9125
634	0X27A	813.9250	858.9250
635	0X27B	813.9375	858.9375
636	0X27C	813.9500	858.9500
637	0X27D	813.9625	858.9625
638	0X27E	813.9750	858.9750
639	0X27F	813.9875	858.9875
640	0X280	814.0000	859.0000
641	0X281	814.0125	859.0125
642	0X282	814.0250	859.0250

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
643	0X283	814.0375	859.0375
644	0X284	814.0500	859.0500
645	0X285	814.0625	859.0625
646	0X286	814.0750	859.0750
647	0X287	814.0875	859.0875
648	0X288	814.1000	859.1000
649	0X289	814.1125	859.1125
650	0X28A	814.1250	859.1250
651	0X28B	814.1375	859.1375
652	0X28C	814.1500	859.1500
653	0X28D	814.1625	859.1625
654	0X28E	814.1750	859.1750
655	0X28F	814.1875	859.1875
656	0X290	814.2000	859.2000
657	0X291	814.2125	859.2125
658	0X292	814.2250	859.2250
659	0X293	814.2375	859.2375
660	0X294	814.2500	859.2500
661	0X295	814.2625	859.2625
662	0X296	814.2750	859.2750
663	0X297	814.2875	859.2875
664	0X298	814.3000	859.3000
665	0X299	814.3125	859.3125
666	0X29A	814.3250	859.3250
667	0X29B	814.3375	859.3375
668	0X29C	814.3500	859.3500
669	0X29D	814.3625	859.3625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
670	0X29E	814.3750	859.3750
671	0X29F	814.3875	859.3875
672	0X2A0	814.4000	859.4000
673	0X2A1	814.4125	859.4125
674	0X2A2	814.4250	859.4250
675	0X2A3	814.4375	859.4375
676	0X2A4	814.4500	859.4500
677	0X2A5	814.4625	859.4625
678	0X2A6	814.4750	859.4750
679	0X2A7	814.4875	859.4875
680	0X2A8	814.5000	859.5000
681	0X2A9	814.5125	859.5125
682	0X2AA	814.5250	859.5250
683	0X2AB	814.5375	859.5375
684	0X2AC	814.5500	859.5500
685	0X2AD	814.5625	859.5625
686	0X2AE	814.5750	859.5750
687	0X2AF	814.5875	859.5875
688	0X2B0	814.6000	859.6000
689	0X2B1	814.6125	859.6125
690	0X2B2	814.6250	859.6250
691	0X2B3	814.6375	859.6375
692	0X2B4	814.6500	859.6500
693	0X2B5	814.6625	859.6625
694	0X2B6	814.6750	859.6750
695	0X2B7	814.6875	859.6875
696	0X2B8	814.7000	859.7000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
697	0X2B9	814.7125	859.7125
698	0X2BA	814.7250	859.7250
699	0X2BB	814.7375	859.7375
700	0X2BC	814.7500	859.7500
701	0X2BD	814.7625	859.7625
702	0X2BE	814.7750	859.7750
703	0X2BF	814.7875	859.7875
704	0X2C0	814.8000	859.8000
705	0X2C1	814.8125	859.8125
706	0X2C2	814.8250	859.8250
707	0X2C3	814.8375	859.8375
708	0X2C4	814.8500	859.8500
709	0X2C5	814.8625	859.8625
710	0X2C6	814.8750	859.8750
711	0X2C7	814.8875	859.8875
712	0X2C8	814.9000	859.9000
713	0X2C9	814.9125	859.9125
714	0X2CA	814.9250	859.9250
715	0X2CB	814.9375	859.9375
716	0X2CC	814.9500	859.9500
717	0X2CD	814.9625	859.9625
718	0X2CE	814.9750	859.9750
719	0X2CF	814.9875	859.9875
720	0X2D0	815.0000	860.0000
721	0X2D1	815.0125	860.0125
722	0X2D2	815.0250	860.0250
723	0X2D3	815.0375	860.0375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
724	0X2D4	815.0500	860.0500
725	0X2D5	815.0625	860.0625
726	0X2D6	815.0750	860.0750
727	0X2D7	815.0875	860.0875
728	0X2D8	815.1000	860.1000
729	0X2D9	815.1125	860.1125
730	0X2DA	815.1250	860.1250
731	0X2DB	815.1375	860.1375
732	0X2DC	815.1500	860.1500
733	0X2DD	815.1625	860.1625
734	0X2DE	815.1750	860.1750
735	0X2DF	815.1875	860.1875
736	0X2E0	815.2000	860.2000
737	0X2E1	815.2125	860.2125
738	0X2E2	815.2250	860.2250
739	0X2E3	815.2375	860.2375
740	0X2E4	815.2500	860.2500
741	0X2E5	815.2625	860.2625
742	0X2E6	815.2750	860.2750
743	0X2E7	815.2875	860.2875
744	0X2E8	815.3000	860.3000
745	0X2E9	815.3125	860.3125
746	0X2EA	815.3250	860.3250
747	0X2EB	815.3375	860.3375
748	0X2EC	815.3500	860.3500
749	0X2ED	815.3625	860.3625
750	0X2EE	815.3750	860.3750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
751	0X2EF	815.3875	860.3875
752	0X2F0	815.4000	860.4000
753	0X2F1	815.4125	860.4125
754	0X2F2	815.4250	860.4250
755	0X2F3	815.4375	860.4375
756	0X2F4	815.4500	860.4500
757	0X2F5	815.4625	860.4625
758	0X2F6	815.4750	860.4750
759	0X2F7	815.4875	860.4875
760	0X2F8	815.5000	860.5000
761	0X2F9	815.5125	860.5125
762	0X2FA	815.5250	860.5250
763	0X2FB	815.5375	860.5375
764	0X2FC	815.5500	860.5500
765	0X2FD	815.5625	860.5625
766	0X2FE	815.5750	860.5750
767	0X2FF	815.5875	860.5875
768	0X300	815.6000	860.6000
769	0X301	815.6125	860.6125
770	0X302	815.6250	860.6250
771	0X303	815.6375	860.6375
772	0X304	815.6500	860.6500
773	0X305	815.6625	860.6625
774	0X306	815.6750	860.6750
775	0X307	815.6875	860.6875
776	0X308	815.7000	860.7000
777	0X309	815.7125	860.7125

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
778	0X30A	815.7250	860.7250
779	0X30B	815.7375	860.7375
780	0X30C	815.7500	860.7500
781	0X30D	815.7625	860.7625
782	0X30E	815.7750	860.7750
783	0X30F	815.7875	860.7875
784	0X310	815.8000	860.8000
785	0X311	815.8125	860.8125
786	0X312	815.8250	860.8250
787	0X313	815.8375	860.8375
788	0X314	815.8500	860.8500
789	0X315	815.8625	860.8625
790	0X316	815.8750	860.8750
791	0X317	815.8875	860.8875
792	0X318	815.9000	860.9000
793	0X319	815.9125	860.9125
794	0X31A	815.9250	860.9250
795	0X31B	815.9375	860.9375
796	0X31C	815.9500	860.9500
797	0X31D	815.9625	860.9625
798	0X31E	815.9750	860.9750
799	0X31F	815.9875	860.9875
800	0X320	816.0000	861.0000
801	0X321	816.0125	861.0125
802	0X322	816.0250	861.0250
803	0X323	816.0375	861.0375
804	0X324	816.0500	861.0500

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
805	0X325	816.0625	861.0625
806	0X326	816.0750	861.0750
807	0X327	816.0875	861.0875
808	0X328	816.1000	861.1000
809	0X329	816.1125	861.1125
810	0X32A	816.1250	861.1250
811	0X32B	816.1375	861.1375
812	0X32C	816.1500	861.1500
813	0X32D	816.1625	861.1625
814	0X32E	816.1750	861.1750
815	0X32F	816.1875	861.1875
816	0X330	816.2000	861.2000
817	0X331	816.2125	861.2125
818	0X332	816.2250	861.2250
819	0X333	816.2375	861.2375
820	0X334	816.2500	861.2500
821	0X335	816.2625	861.2625
822	0X336	816.2750	861.2750
823	0X337	816.2875	861.2875
824	0X338	816.3000	861.3000
825	0X339	816.3125	861.3125
826	0X33A	816.3250	861.3250
827	0X33B	816.3375	861.3375
828	0X33C	816.3500	861.3500
829	0X33D	816.3625	861.3625
830	0X33E	816.3750	861.3750
831	0X33F	816.3875	861.3875

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
832	0X340	816.4000	861.4000
833	0X341	816.4125	861.4125
834	0X342	816.4250	861.4250
835	0X343	816.4375	861.4375
836	0X344	816.4500	861.4500
837	0X345	816.4625	861.4625
838	0X346	816.4750	861.4750
839	0X347	816.4875	861.4875
840	0X348	816.5000	861.5000
841	0X349	816.5125	861.5125
842	0X34A	816.5250	861.5250
843	0X34B	816.5375	861.5375
844	0X34C	816.5500	861.5500
845	0X34D	816.5625	861.5625
846	0X34E	816.5750	861.5750
847	0X34F	816.5875	861.5875
848	0X350	816.6000	861.6000
849	0X351	816.6125	861.6125
850	0X352	816.6250	861.6250
851	0X353	816.6375	861.6375
852	0X354	816.6500	861.6500
853	0X355	816.6625	861.6625
854	0X356	816.6750	861.6750
855	0X357	816.6875	861.6875
856	0X358	816.7000	861.7000
857	0X359	816.7125	861.7125
858	0X35A	816.7250	861.7250

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
859	0X35B	816.7375	861.7375
860	0X35C	816.7500	861.7500
861	0X35D	816.7625	861.7625
862	0X35E	816.7750	861.7750
863	0X35F	816.7875	861.7875
864	0X360	816.8000	861.8000
865	0X361	816.8125	861.8125
866	0X362	816.8250	861.8250
867	0X363	816.8375	861.8375
868	0X364	816.8500	861.8500
869	0X365	816.8625	861.8625
870	0X366	816.8750	861.8750
871	0X367	816.8875	861.8875
872	0X368	816.9000	861.9000
873	0X369	816.9125	861.9125
874	0X36A	816.9250	861.9250
875	0X36B	816.9375	861.9375
876	0X36C	816.9500	861.9500
877	0X36D	816.9625	861.9625
878	0X36E	816.9750	861.9750
879	0X36F	816.9875	861.9875
880	0X370	817.0000	862.0000
881	0X371	817.0125	862.0125
882	0X372	817.0250	862.0250
883	0X373	817.0375	862.0375
884	0X374	817.0500	862.0500
885	0X375	817.0625	862.0625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
886	0X376	817.0750	862.0750
887	0X377	817.0875	862.0875
888	0X378	817.1000	862.1000
889	0X379	817.1125	862.1125
890	0X37A	817.1250	862.1250
891	0X37B	817.1375	862.1375
892	0X37C	817.1500	862.1500
893	0X37D	817.1625	862.1625
894	0X37E	817.1750	862.1750
895	0X37F	817.1875	862.1875
896	0X380	817.2000	862.2000
897	0X381	817.2125	862.2125
898	0X382	817.2250	862.2250
899	0X383	817.2375	862.2375
900	0X384	817.2500	862.2500
901	0X385	817.2625	862.2625
902	0X386	817.2750	862.2750
903	0X387	817.2875	862.2875
904	0X388	817.3000	862.3000
905	0X389	817.3125	862.3125
906	0X38A	817.3250	862.3250
907	0X38B	817.3375	862.3375
908	0X38C	817.3500	862.3500
909	0X38D	817.3625	862.3625
910	0X38E	817.3750	862.3750
911	0X38F	817.3875	862.3875
912	0X390	817.4000	862.4000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
913	0X391	817.4125	862.4125
914	0X392	817.4250	862.4250
915	0X393	817.4375	862.4375
916	0X394	817.4500	862.4500
917	0X395	817.4625	862.4625
918	0X396	817.4750	862.4750
919	0X397	817.4875	862.4875
920	0X398	817.5000	862.5000
921	0X399	817.5125	862.5125
922	0X39A	817.5250	862.5250
923	0X39B	817.5375	862.5375
924	0X39C	817.5500	862.5500
925	0X39D	817.5625	862.5625
926	0X39E	817.5750	862.5750
927	0X39F	817.5875	862.5875
928	0X3A0	817.6000	862.6000
929	0X3A1	817.6125	862.6125
930	0X3A2	817.6250	862.6250
931	0X3A3	817.6375	862.6375
932	0X3A4	817.6500	862.6500
933	0X3A5	817.6625	862.6625
934	0X3A6	817.6750	862.6750
935	0X3A7	817.6875	862.6875
936	0X3A8	817.7000	862.7000
937	0X3A9	817.7125	862.7125
938	0X3AA	817.7250	862.7250
939	0X3AB	817.7375	862.7375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
940	0X3AC	817.7500	862.7500
941	0X3AD	817.7625	862.7625
942	0X3AE	817.7750	862.7750
943	0X3AF	817.7875	862.7875
944	0X3B0	817.8000	862.8000
945	0X3B1	817.8125	862.8125
946	0X3B2	817.8250	862.8250
947	0X3B3	817.8375	862.8375
948	0X3B4	817.8500	862.8500
949	0X3B5	817.8625	862.8625
950	0X3B6	817.8750	862.8750
951	0X3B7	817.8875	862.8875
952	0X3B8	817.9000	862.9000
953	0X3B9	817.9125	862.9125
954	0X3BA	817.9250	862.9250
955	0X3BB	817.9375	862.9375
956	0X3BC	817.9500	862.9500
957	0X3BD	817.9625	862.9625
958	0X3BE	817.9750	862.9750
959	0X3BF	817.9875	862.9875
960	0X3C0	818.0000	863.0000
961	0X3C1	818.0125	863.0125
962	0X3C2	818.0250	863.0250
963	0X3C3	818.0375	863.0375
964	0X3C4	818.0500	863.0500
965	0X3C5	818.0625	863.0625
966	0X3C6	818.0750	863.0750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
967	0X3C7	818.0875	863.0875
968	0X3C8	818.1000	863.1000
969	0X3C9	818.1125	863.1125
970	0X3CA	818.1250	863.1250
971	0X3CB	818.1375	863.1375
972	0X3CC	818.1500	863.1500
973	0X3CD	818.1625	863.1625
974	0X3CE	818.1750	863.1750
975	0X3CF	818.1875	863.1875
976	0X3D0	818.2000	863.2000
977	0X3D1	818.2125	863.2125
978	0X3D2	818.2250	863.2250
979	0X3D3	818.2375	863.2375
980	0X3D4	818.2500	863.2500
981	0X3D5	818.2625	863.2625
982	0X3D6	818.2750	863.2750
983	0X3D7	818.2875	863.2875
984	0X3D8	818.3000	863.3000
985	0X3D9	818.3125	863.3125
986	0X3DA	818.3250	863.3250
987	0X3DB	818.3375	863.3375
988	0X3DC	818.3500	863.3500
989	0X3DD	818.3625	863.3625
990	0X3DE	818.3750	863.3750
991	0X3DF	818.3875	863.3875
992	0X3E0	818.4000	863.4000
993	0X3E1	818.4125	863.4125

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
994	0X3E2	818.4250	863.4250
995	0X3E3	818.4375	863.4375
996	0X3E4	818.4500	863.4500
997	0X3E5	818.4625	863.4625
998	0X3E6	818.4750	863.4750
999	0X3E7	818.4875	863.4875
1000	0X3E8	818.5000	863.5000
1001	0X3E9	818.5125	863.5125
1002	0X3EA	818.5250	863.5250
1003	0X3EB	818.5375	863.5375
1004	0X3EC	818.5500	863.5500
1005	0X3ED	818.5625	863.5625
1006	0X3EE	818.5750	863.5750
1007	0X3EF	818.5875	863.5875
1008	0X3F0	818.6000	863.6000
1009	0X3F1	818.6125	863.6125
1010	0X3F2	818.6250	863.6250
1011	0X3F3	818.6375	863.6375
1012	0X3F4	818.6500	863.6500
1013	0X3F5	818.6625	863.6625
1014	0X3F6	818.6750	863.6750
1015	0X3F7	818.6875	863.6875
1016	0X3F8	818.7000	863.7000
1017	0X3F9	818.7125	863.7125
1018	0X3FA	818.7250	863.7250
1019	0X3FB	818.7375	863.7375
1020	0X3FC	818.7500	863.7500

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1021	0X3FD	818.7625	863.7625
1022	0X3FE	818.7750	863.7750
1023	0X3FF	818.7875	863.7875
1024	0X400	818.8000	863.8000
1025	0X401	818.8125	863.8125
1026	0X402	818.8250	863.8250
1027	0X403	818.8375	863.8375
1028	0X404	818.8500	863.8500
1029	0X405	818.8625	863.8625
1030	0X406	818.8750	863.8750
1031	0X407	818.8875	863.8875
1032	0X408	818.9000	863.9000
1033	0X409	818.9125	863.9125
1034	0X40A	818.9250	863.9250
1035	0X40B	818.9375	863.9375
1036	0X40C	818.9500	863.9500
1037	0X40D	818.9625	863.9625
1038	0X40E	818.9750	863.9750
1039	0X40F	818.9875	863.9875
1040	0X410	819.0000	864.0000
1041	0X411	819.0125	864.0125
1042	0X412	819.0250	864.0250
1043	0X413	819.0375	864.0375
1044	0X414	819.0500	864.0500
1045	0X415	819.0625	864.0625
1046	0X416	819.0750	864.0750
1047	0X417	819.0875	864.0875

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1048	0X418	819.1000	864.1000
1049	0X419	819.1125	864.1125
1050	0X41A	819.1250	864.1250
1051	0X41B	819.1375	864.1375
1052	0X41C	819.1500	864.1500
1053	0X41D	819.1625	864.1625
1054	0X41E	819.1750	864.1750
1055	0X41F	819.1875	864.1875
1056	0X420	819.2000	864.2000
1057	0X421	819.2125	864.2125
1058	0X422	819.2250	864.2250
1059	0X423	819.2375	864.2375
1060	0X424	819.2500	864.2500
1061	0X425	819.2625	864.2625
1062	0X426	819.2750	864.2750
1063	0X427	819.2875	864.2875
1064	0X428	819.3000	864.3000
1065	0X429	819.3125	864.3125
1066	0X42A	819.3250	864.3250
1067	0X42B	819.3375	864.3375
1068	0X42C	819.3500	864.3500
1069	0X42D	819.3625	864.3625
1070	0X42E	819.3750	864.3750
1071	0X42F	819.3875	864.3875
1072	0X430	819.4000	864.4000
1073	0X431	819.4125	864.4125
1074	0X432	819.4250	864.4250

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1075	0X433	819.4375	864.4375
1076	0X434	819.4500	864.4500
1077	0X435	819.4625	864.4625
1078	0X436	819.4750	864.4750
1079	0X437	819.4875	864.4875
1080	0X438	819.5000	864.5000
1081	0X439	819.5125	864.5125
1082	0X43A	819.5250	864.5250
1083	0X43B	819.5375	864.5375
1084	0X43C	819.5500	864.5500
1085	0X43D	819.5625	864.5625
1086	0X43E	819.5750	864.5750
1087	0X43F	819.5875	864.5875
1088	0X440	819.6000	864.6000
1089	0X441	819.6125	864.6125
1090	0X442	819.6250	864.6250
1091	0X443	819.6375	864.6375
1092	0X444	819.6500	864.6500
1093	0X445	819.6625	864.6625
1094	0X446	819.6750	864.6750
1095	0X447	819.6875	864.6875
1096	0X448	819.7000	864.7000
1097	0X449	819.7125	864.7125
1098	0X44A	819.7250	864.7250
1099	0X44B	819.7375	864.7375
1100	0X44C	819.7500	864.7500
1101	0X44D	819.7625	864.7625

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1102	0X44E	819.7750	864.7750
1103	0X44F	819.7875	864.7875
1104	0X450	819.8000	864.8000
1105	0X451	819.8125	864.8125
1106	0X452	819.8250	864.8250
1107	0X453	819.8375	864.8375
1108	0X454	819.8500	864.8500
1109	0X455	819.8625	864.8625
1110	0X456	819.8750	864.8750
1111	0X457	819.8875	864.8875
1112	0X458	819.9000	864.9000
1113	0X459	819.9125	864.9125
1114	0X45A	819.9250	864.9250
1115	0X45B	819.9375	864.9375
1116	0X45C	819.9500	864.9500
1117	0X45D	819.9625	864.9625
1118	0X45E	819.9750	864.9750
1119	0X45F	819.9875	864.9875
1120	0X460	820.0000	865.0000
1121	0X461	820.0125	865.0125
1122	0X462	820.0250	865.0250
1123	0X463	820.0375	865.0375
1124	0X464	820.0500	865.0500
1125	0X465	820.0625	865.0625
1126	0X466	820.0750	865.0750
1127	0X467	820.0875	865.0875
1128	0X468	820.1000	865.1000

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1129	0X469	820.1125	865.1125
1130	0X46A	820.1250	865.1250
1131	0X46B	820.1375	865.1375
1132	0X46C	820.1500	865.1500
1133	0X46D	820.1625	865.1625
1134	0X46E	820.1750	865.1750
1135	0X46F	820.1875	865.1875
1136	0X470	820.2000	865.2000
1137	0X471	820.2125	865.2125
1138	0X472	820.2250	865.2250
1139	0X473	820.2375	865.2375
1140	0X474	820.2500	865.2500
1141	0X475	820.2625	865.2625
1142	0X476	820.2750	865.2750
1143	0X477	820.2875	865.2875
1144	0X478	820.3000	865.3000
1145	0X479	820.3125	865.3125
1146	0X47A	820.3250	865.3250
1147	0X47B	820.3375	865.3375
1148	0X47C	820.3500	865.3500
1149	0X47D	820.3625	865.3625
1150	0X47E	820.3750	865.3750
1151	0X47F	820.3875	865.3875
1152	0X480	820.4000	865.4000
1153	0X481	820.4125	865.4125
1154	0X482	820.4250	865.4250
1155	0X483	820.4375	865.4375

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1156	0X484	820.4500	865.4500
1157	0X485	820.4625	865.4625
1158	0X486	820.4750	865.4750
1159	0X487	820.4875	865.4875
1160	0X488	820.5000	865.5000
1161	0X489	820.5125	865.5125
1162	0X48A	820.5250	865.5250
1163	0X48B	820.5375	865.5375
1164	0X48C	820.5500	865.5500
1165	0X48D	820.5625	865.5625
1166	0X48E	820.5750	865.5750
1167	0X48F	820.5875	865.5875
1168	0X490	820.6000	865.6000
1169	0X491	820.6125	865.6125
1170	0X492	820.6250	865.6250
1171	0X493	820.6375	865.6375
1172	0X494	820.6500	865.6500
1173	0X495	820.6625	865.6625
1174	0X496	820.6750	865.6750
1175	0X497	820.6875	865.6875
1176	0X498	820.7000	865.7000
1177	0X499	820.7125	865.7125
1178	0X49A	820.7250	865.7250
1179	0X49B	820.7375	865.7375
1180	0X49C	820.7500	865.7500
1181	0X49D	820.7625	865.7625
1182	0X49E	820.7750	865.7750

Table B-1. iDEN Frequency Table (Continued)

Carrier Number (Decimal)	Carrier Number (Hex)	Mobile Station Outbound Frequency (MHz)	Mobile Station Inbound Frequency (MHz)
1183	0X49F	820.7875	865.7875
1184	0X4A0	820.8000	865.8000
1185	0X4A1	820.8125	865.8125
1186	0X4A2	820.8250	865.8250
1187	0X4A3	820.8375	865.8375
1188	0X4A4	820.8500	865.8500
1189	0X4A5	820.8625	865.8625
1190	0X4A6	820.8750	865.8750
1191	0X4A7	820.8875	865.8875
1192	0X4A8	820.9000	865.9000
1193	0X4A9	820.9125	865.9125
1194	0X4AA	820.9250	865.9250
1195	0X4AB	820.9375	865.9375
1196	0X4AC	820.9500	865.9500
1197	0X4AD	820.9625	865.9625
1198	0X4AE	820.9750	865.9750
1199	0X4AF	820.9875	865.9875

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Appendix

C WARRANTY

C-1 WARRANTY TERMS

Harris Corporation - Wireless Products Group

Effective Date: February 15, 2011

This is a Maintenance Agreement between Harris Corporation, acting through is Government Communications Systems Division, ("Harris") and the Buyer or User of the Equipment (collectively, the "Buyer"). Harris and the Buyer agree as follows:

1. **Definitions.** In addition to the terms defined in the Agreement, capitalized terms used herein have the following meanings:
    a. "Agreement" means the instrument of contracting; such as a Purchase Order, or other such designation which these terms and conditions of sale for Wireless Equipment, Software and Services are incorporated.
    b. "Buyer" means the purchaser of the Equipment, Software, or Services from Harris.
    c. "Date of Acceptance" means the date when the Customer receives an item of Equipment, Software and/or Services unless Customer otherwise notifies Harris in writing that the Equipment, Software and/or Services was delivered in a defective condition.
    d. "Equipment" means any Harris Wireless Products Group hardware and accessories, including components, but excluding any Software or Services.
    e. "Harris" means Harris Corporation, acting through its Government Communications Systems Division, Wireless Products Group.
    f. "Purchase Order" means the Customer's purchase order as acknowledged by Harris on its standard acknowledgement form.
    g. "Purchase Price" means the purchase price as identified in the Purchase Order.
    h. "Quote" means the price quotation of Harris itemizing the purchase price and includes all exhibits referred to within such Quote, including but not limited to the technical proposal, technical specifications, scope of work, schedule, the Agreement and any maintenance agreement specifically included in the purchase price.
    i. "Services" means training, maintenance support, or other services to be provided to Customer as part of the Agreement.
    j. "Software" means software and firmware, including all copies provided to Customer.
    k. "User" means the actual end-user of the Equipment if such person or entity is not the same as the Buyer.
2. **Standard Limited 12-Month Maintenance Agreement.**
    a. Scope. This Maintenance Agreement applies to all Harris Equipment purchased under the Agreement and used for the purposes normally intended, except for Equipment specifically excluded.

NOTE

This Maintenance Agreements also includes:

- Customer Telephone Support (8 am – 6 pm ET)
- Warranty on hardware
- Notification of and free access to software upgrades as released

b. Term. This Maintenance Agreement is valid for one (1) year from the date of Equipment purchase.

c. Repair or Replacement. Harris will, at its option, repair or replace the defective Equipment or defective part of the Equipment without charge to the Buyer. Buyer must notify Harris in writing of any defect within ten (10) days from the date of Buyer's discovery of the defect. If Harris confirms that a defect exists and Harris is unable to resolve the problem without having the Equipment shipped to Harris, then Harris will, at its option and its cost, repair or replace the defective Equipment or defective part and return the Equipment to the Buyer, provided however, that the repair or replacement is due to a cause covered under this Maintenance Agreement. The foregoing is the sole and exclusive remedy under this Maintenance Agreement.

3. **Items Excluded from this Maintenance Agreement.** The following are not covered under this Maintenance Agreement:

   a. Defects or failures caused by Buyer or User abuse or misuse of the Equipment.

   b. Defects or failures caused by unauthorized attempts to repair or alter the Equipment in any way.

   c. Items of temporary and/or inherently indeterminate life, such as bulbs, fuses, batteries, etc.

4. **Maintenance Agreement Service Warranty.**

   a. Any repair service performed by Harris under this Agreement is warranted to be free from defects in material or workmanship for sixty (60) days from the date of repair or the remaining term of this Agreement, whichever is longer. All terms and exclusions of this Maintenance Agreement apply to such warranty.

   b. HARRIS MAKES NO OTHER AGREEMENTS BEYOND THE EXPRESS MAINTENANCE AGREEMENT AS CONTAINED HEREIN. ALL EXPRESS OR IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY ARE EXCLUDED. IN NO EVENT SHALL HARRIS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, EXEMPLARY OR CONSEQUENTIAL DAMAGES, ARISING FROM OR RELATING TO THE PERFORMANCE OR NONPERFORMANCE OF THIS MAINTENANCE AGREEMENT OR ANY ACTS OR OMISSIONS RELATED TO THE USE OF ANY EQUIPMENT DELIVERED OR SERVICES FURNISHED HEREUNDER, INCLUDING, BUT NOT LIMITED TO, LOSS OF REVENUE, LOSS OF PROFITS, OR LOSS OF BENEFICIAL USE, EVEN IF HARRIS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS LIMITATION SHALL APPLY TO ANY CLAIM OR CAUSE OF ACTION WHETHER IN CONTRACT OR TORT (INCLUDING NEGLIGENCE, STRICT LIABILITY OR BREACH OF WARRANTY).

5. **Extended Annual Maintenance Agreement.** Upon expiration of the Standard Limited 12-Month Maintenance Agreement as described in Paragraph 2, an Extended Annual Maintenance Agreement may be purchased for the Equipment. Pricing for annual maintenance is available by quote upon written request. Extended Annual Maintenance Agreements will be referenced to the top level serial number of the Equip-

ment for which the original Maintenance Agreement was purchased. Software protocols and peripheral controllers also will be covered under the Extended Annual Maintenance Agreement. However, if an additional software protocol is purchased after the initial purchase of Equipment, the Maintenance Agreement will be extended for one (1) year at no additional cost to the Buyer from the purchase date of the additional protocol.

6. **Payment Terms.** Domestic Purchase Orders for Maintenance Agreements require full payment of the Purchase Price prior to the start of the term of the Maintenance Agreement and of Harris' obligation to perform.

7. **Restricted Use.** The Equipment covered under this Maintenance Agreement is a restricted use item and can only be sold to authorized U.S. government agencies, or other authorized users, pursuant to 18 U.S.C. § 2510 et seq. Use of Equipment is strictly governed by applicable federal, state and local law associated with the intercept and monitoring of oral communications. Harris assumes no liability for any use, misuse or improper use of the Equipment and makes no representations as to Equipment suitability for any specific application. Buyer's right to transfer, sell or assign the Equipment shall be limited to authorized law enforcement and government agencies with the prior written consent of Harris.

8. **Compliance with Laws.** Buyer shall comply with all applicable federal, state and local laws, regulations, rules and orders related to the use of the Equipment.

9. **U.S. export License and Transfer Approvals.** Buyer represents and warrants that no technical data furnished related to the Equipment shall be disclosed to any foreign nation, person, firm, or country, nor shall any technical data be exported from the United States without first complying with all requirements of the International Traffic in Arms Regulations (ITAR) or the Export Administration Regulations (EAR), including the requirement for obtaining any export license if applicable. Buyer shall first obtain the written consent of Harris prior to submitting any request for authority to export any such technical data. If Buyer receives export controlled information and improperly discloses such information provided Harris properly identified the information as export controlled at the time of Buyer's receipt, Buyer shall to the fullest extent permitted by law indemnify and hold Harris harmless from all claims, demands, damages, costs, fines, penalties, attorney's fees, and all other expenses arising from failure of the Buyer to comply with this clause or with the ITAR or EAR, and from any third party claims or noncompliance by Buyer, its agents or employees.

10. **Pricing.** The Equipment is being sold in accordance with the current price list published by Harris. Prices and the terms and conditions of sale are subject to change without notice.

11. **License.** By acceptance of delivery and/or use of the Equipment, the Buyer grants Harris a nonexclusive, nontransferable, worldwide, paid-up license to use the Software and documentation only on the designated Equipment and in conjunction with the Agreement and with Harris' customary business operations. Buyer shall not copy the Software and all Software, manuals and associated documentation remain the property of the Harris or of the Software developer or licensor. No transfer of ownership or rights in technical data, patents, copyrights or trade secrets are expressed or implied.

12. **Rights to Inventions.** All Inventions are and shall at all times remain Harris' Confidential Information. All rights, title and interest in and to the Inventions, including all intellectual property rights, remain vested in Harris, its suppliers or licensors, subject only to the license grant below. For purposes hereof, "Inventions" shall mean and include all ideas, concepts, know-how, techniques, inventions, discoveries, improvements, specifications, designs, methods, devices, systems, reports, studies, computer software (in object or source code), programming and other documentation, flow charts, diagrams and all other information or tangible material of any nature whatsoever (in any medium and in any stage of development or completion) included in or resulting from the Equipment, that are conceived, designed, practiced, prepared, produced or developed by Harris or any of its personnel during the course of Buyer's use of the Equipment.

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